THE Chemical Age

VOL. LXXII 26 FEBRUARY 1955 No. 1859

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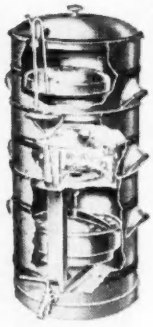
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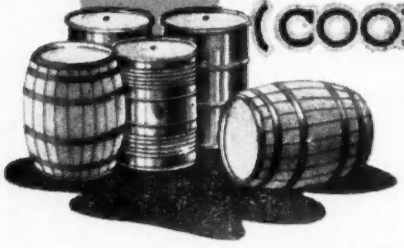
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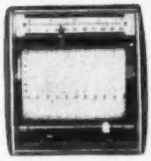
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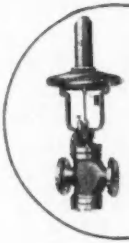
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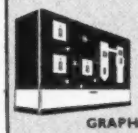
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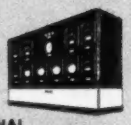


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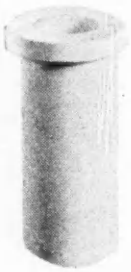
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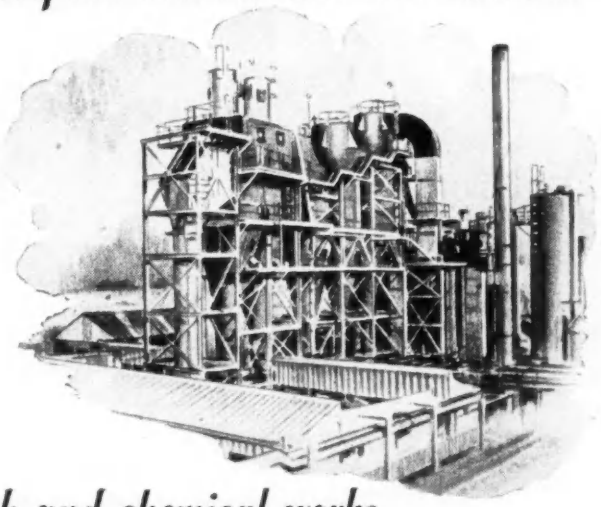
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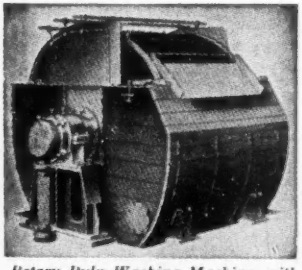
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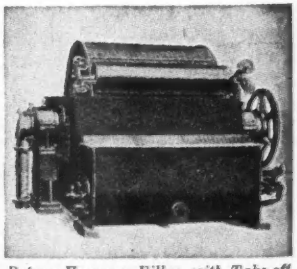
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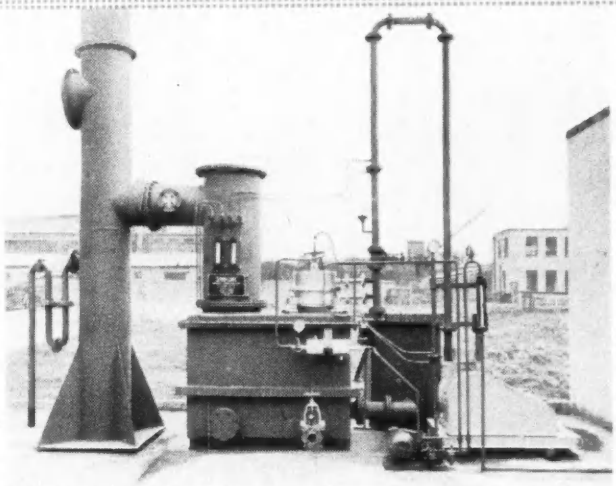


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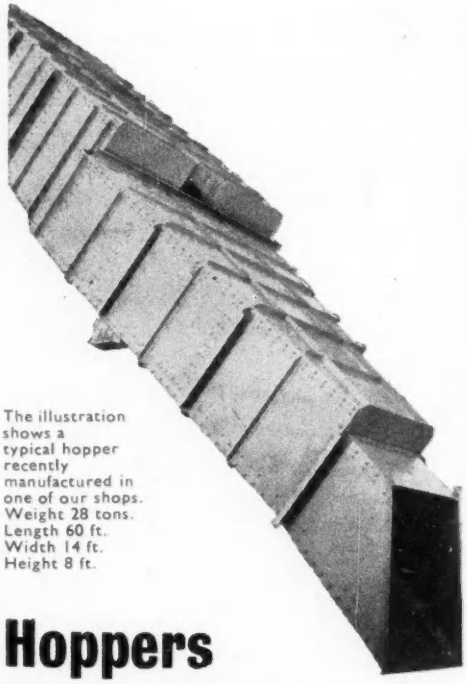


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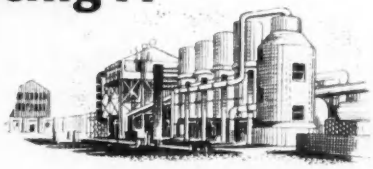
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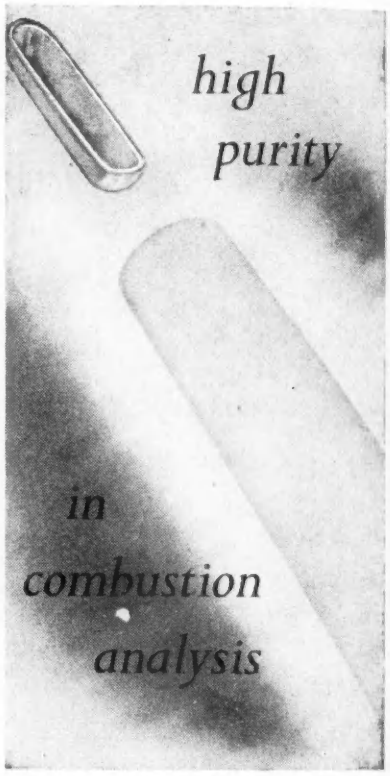
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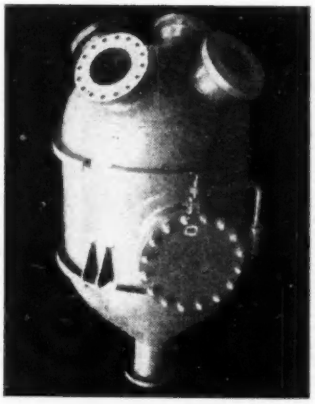
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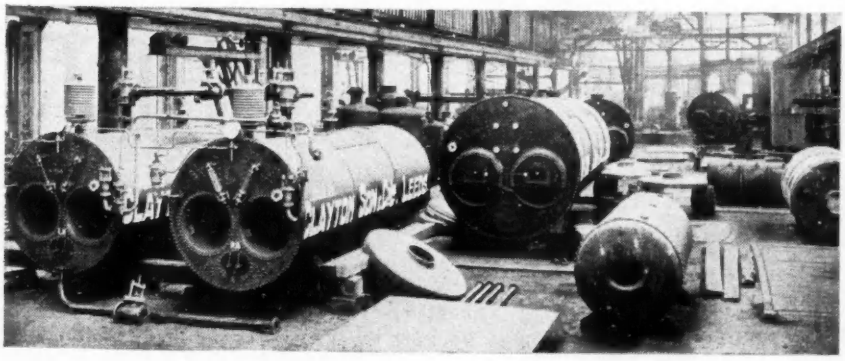
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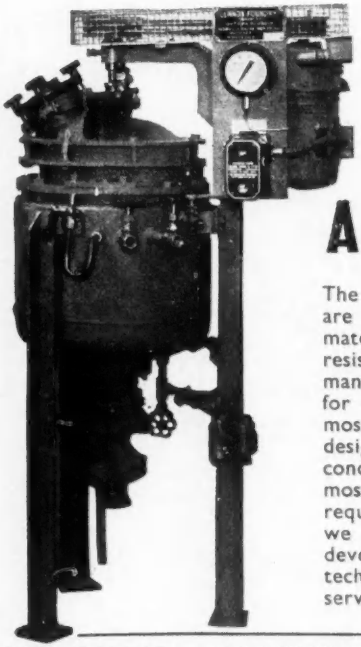
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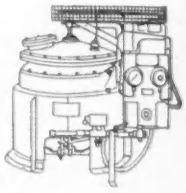
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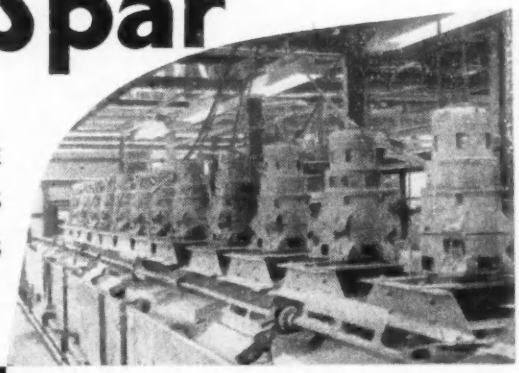
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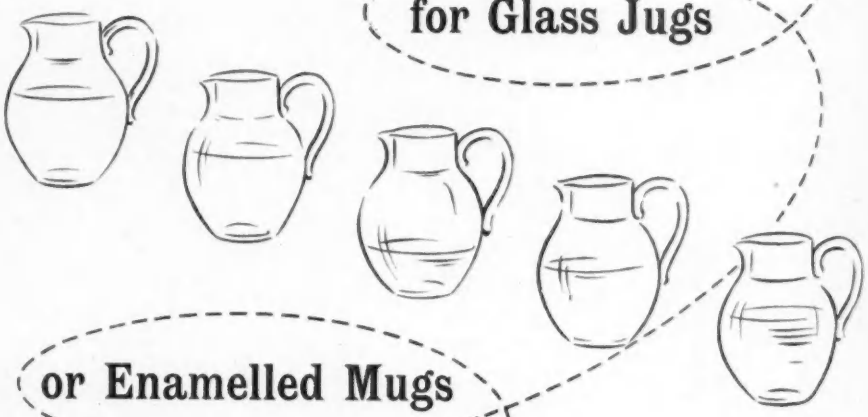
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The Chemical Age

Established 1919

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CONTENTS . 26 FEBRUARY 1955

Work Begins at Alderley	524
The Export Situation	525
Size Distribution Analysis	526
Photometric Methods of Analysis	527
Sulphurous Materials	535
The Chemist's Bookshelf	537
Drug Prices Criticised	538
Home News Items	539
Overseas News Items	540
Personal	541
Publications & Announcements	543
British Chemical Prices	544
Chemical & Allied Stocks & Shares	548
Heavy Water Company	549
Next Week's Events	550

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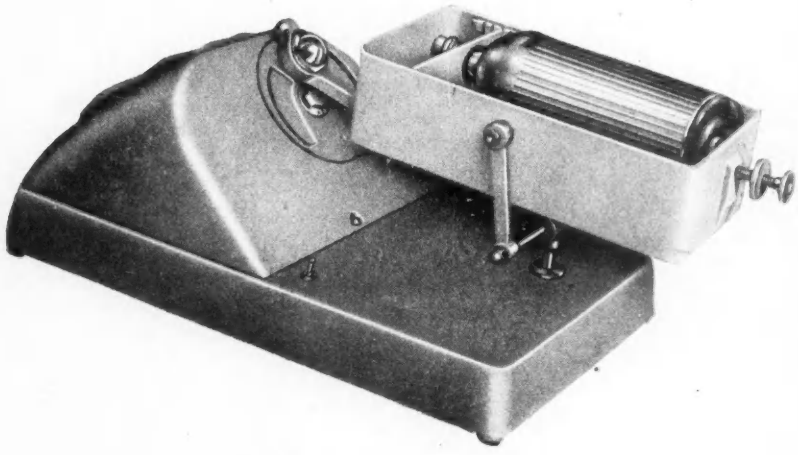
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Work Study

MUCH more attention has been paid to work study in the chemical industry during the past two or three years. It could be said without factual injustice that the chemical industry has been lagging behind several other great sections of industry in developing this modern means of improving manufacturing efficiency. This seems almost paradoxical. More than in most industries, management in the chemical industry is scientific—and work study is a basic tool of scientific management. Indeed, one of the early classic books on the subject, by Frederick Winslow Taylor, and dated 1911, was not called Work Study or Time and Motion Study, but much more fundamentally 'The Principles of Scientific Management'. However, it is not unnatural for the chemical industry to have shown belated interest. Work study has tended to concentrate upon the utilisation of labour and on the whole the cost of labour has not been the most dominant cost factor in chemical production. Then again, many chemical factories carry out a mixed assortment of processes with a versatility that has evolved fortuitiously rather than by co-ordinated plan, some of them continuous processes, some of them batch processes, some of them in daily operation, some only intermittently used. It is not easy to simplify such a background and the past successes of work study have largely been obtained where manufacturing flowlines can be simplified.

The new awareness that work study can help the industry is timely. The cost of labour may still not comprise the lion's share of costs, but increased competition for export trade makes it imperative for all forms of costs to be carefully controlled. Recently, Mr. J. Grange Moore, of I.C.I.'s Work Study Department, lectured on this subject to the British Association of Chemists. He produced some interesting figures from his own company's records. In one year (1953) that company spent £67,000,000 on labour, £181,000,000 on materials and depreciation, and the capital investment in equipment to use these resources was about £233,000,000. Thus, for an exceedingly mixed chemical enterprise on the large scale, ranging from heavy to refined chemicals, the ratio of labour costs and material costs was roughly 1 : 2.7. In seeking economy, it may be tempting to devote principal attention to the 2.7 side of this ratio, but there are limits to what can be saved. An established process will probably have exhausted most of the economies that can be achieved in materials costs; a new process, if initially well designed in its laboratory and pilot-scale stages, will offer only minor opportunities for savings of this kind. But in a works where work study has never been applied, the smaller side of the ratio, the £1 spent upon labour for every £2.7 spent upon materials, may well offer better opportunities for cutting production costs. In any case, there is no relativity in measures of economy. A saving of 3d. per hundredweight or ton of product has the same effect upon final costs whatever may be its nature, and there is no excuse for not bothering to pursue it. Even in the factory of exceedingly mixed processes and where the materials costs are 10 or more times the labour costs, there are departments in

which expenditure upon labour dominates the actual work done, e.g., packing and loading, intake of raw materials.

Also, the labour costs of chemical manufacturing have risen more in the past few years than most raw material costs. Costs of many materials have not ascended on the same inflationary gradient as rates per hour. Unless processes have been modified to reduce their remand upon man-hours, the proportionate cost of labour is greater today than it was before the war. This is a generalisation with exceptions, of course, but it has enough accuracy of application to be put forward as another topical reason for utilising work study methods in the chemical industry.

Much of the past history of work study and time and motion study is to be found in the engineering industry, especially in assembly-line production. It is not wholly a history of peace and content. The stop-watch in the hand of a visiting expert was not a popular innovation in days of serious unemployment, and it has needed all the background of full employment to reduce the tendency for Luddite-like reaction. Indeed, for psychological reasons the older label of 'time and motion study' has been discarded. Earlier enthusiasts of work study were often too hasty, thus defeating their own chances of success. The great pioneers like Taylor knew their subject and its pitfalls better. Taylor cites a case in which he warned a company that changes in its working methods could not be accomplished in less than three to five years, a warning that its work study enthusiasts entirely disregarded. 'The result was a series of strikes, followed by the downfall of the men who attempted to make the change, and by a return to conditions throughout the establishment far worse than those which existed before. . . .' It is much easier today to introduce work study as an approach to reorganisation, not only because fear of unemployment is less real among workers but also because its function is more fully understood by both management and managed. It is not as difficult now to convince men that the aims of work study are in their own interest as well as in the company's, and the association of incentive payments with work study benefits is far closer. The chemical industry should be particularly amenable to work study invasion. It has always required a high proportion of skilled labour which means that in general the intelligence-level of the labour force is high, and this means that the response will be receptive and co-operative.

Work study is far more a check upon management than upon workers. It spotlights bad organisation, faulty plant design and placement, and unclear instructions far more than it spotlights reluctance to do a fair day's work. It is no longer looked upon as a means of extracting more effort from the man but rather as a means of re-planning the system of work so that the same effort, or even a lesser effort, can produce a bigger result. In an elementary form, work study in a branch of the industry—fertiliser manufacture—where there is much handling of materials has shown that more sensible placement of incoming raw materials can alone bring about notable increases in tonnage output per man-week. The results obtained by work study often seem obvious enough; but their obviousness has previously been obscured by the routine acceptance of fixed habits of organisation and working.

Some of the greatest gains from work study are unexpected, and this is likely to be frequently demonstrated in the chemical industry. The dissection of a production line will often isolate one particular operation as the major cause of time-wastage or labour-demand. By concentrating research attention upon the improvement of this part of the process, particularly when its defects have previously been ignored or accepted as 'the nature of the beast', significant processing improvements may often be fostered. It was Kelvin who many years ago observed that we know little or nothing about an effect until we can measure it and express it as a number. Work study does no more than this for the utilisation of the resources of labour and equipment in industry. Management, immersed in the day-to-day problems of maintaining the existing system, cannot easily find the extra time and energy required for task isolation and analysis. That must be understood at all levels if managers are not to feel that work study innovation is a form of criticism.

Notes & Comments

Washed or Unwashed?

A PARTICULARLY interesting chemical problem is posed by the need to detect whether eggs have been washed. This may sound a strange requirement, but for once in a way hygiene is a defect—washing eggs on the farm injures their storing quality, for the natural resistance of the shell is impaired. Huge losses have been caused in refrigerated stores through the decay susceptibility of washed eggs. On the other hand, the dirty egg fetches a lower market price so farmers tend to wash off the discounting evidence! In Eire egg washing is forbidden; in Australia poultry farmers are required to label separately all eggs that have been washed. But distinction needs a test, and to distinguish between the clean egg and the washed-clean egg has presented a scientific challenge. The best answer seems to have been given by recent DSIR research work (*Journal of Science of Food and Technology*, 1955, **6**, 37).

Australian & US Methods

THE process of washing an egg removes the more soluble mineral substances from the shell, notably potassium chloride. A drop of distilled water placed upon the shell of a washed egg will dissolve less ionisable material immediately than when placed on the shell of an unwashed egg. The drop will therefore have less electrical conductivity. This has been made the basis of a simple distinguishing test in New South Wales, but it has the weakness that unwashed eggs stored in humid air conditions can also lose most of their shell content of potassium chloride. A second method developed in America is to allow a drop of distilled water to stay on the egg for five minutes, then to react the drop with another drop of sodium cobaltinitrite solution; the turbidity effect through precipitation of the potassium salt is generally too negligible to be observed if the egg has been washed. The new method developed by the DSIR Low Temperature Research Station (Cambridge) relies upon chloride detection. Drop reaction paper impregnated with silver nitrate solution is used to receive a micro-drop of water from the egg-shell; a micro-drop of silver nitrate solution is also applied to the centre of the moist circle formed by the first drop. Ultra-violet light then induces the photochemical decomposition of any silver chloride formed, and the amount of chloride present can be readily assessed from the depth and diameter of darkness formed.

The Most Accurate Test

OF the three tests, the DSIR test has distinguished between known washed or unwashed eggs with the greatest accuracy. The conductivity test depends upon deciding what the borderline measurement is between washed and unwashed eggs, and its accuracy rests upon that decision. The turbidity test is either positive or negative; it was able to detect correctly 86 per cent of unwashed eggs and 78 per cent of washed eggs in a large sample. The DSIR test correctly identified 89 per cent of all the eggs in the same sample. It might be thought, perhaps, that these percentages are not high enough for a test with potential legal-commercial consequences; in general, however, the egg buyers' problem is to check whether there are any washed eggs in a batch and not to decide the past history of each egg. If there are washed eggs present, then the whole batch is rejected. This must be one of the most curious chemical test developments of recent years.

Volume of Exports

AS we reported some weeks ago (THE CHEMICAL AGE, 1955, **72**, 321), UK exports of chemicals in 1954 reached a record value of £203,840,892. Figures now published in the *Board of Trade Journal* show that the increase in the export volume, as opposed to value, also touched comparatively dizzy heights. Taking the volume of

trade in 1950 as being 100, the figures for the last three years are shown as follows: 1952, 108; 1953, 114; 1954, 151. This increase has been maintained steadily, quarter by quarter, since the middle of 1953, apart from a very slight drop at the beginning of last year. In the last quarter of 1954 the export volume, using the same method of calculation, had reached 174, compared with 125 in the first quarter. A similar state of affairs exists in the field of petroleum and petroleum products, where exports also reached a record value (£84,250,000). The increase in volume here, reflecting increased refinery capacity, reads something like the scorecard of an increasingly successful cricket team. Starting at a modest 100 in 1950, it went to 286 in 1952, 405 in 1953 and 481 in 1954. Imports of both chemicals and crude petroleum showed considerable increases during the year; they were, of course, necessary to maintain increased output and exports. Unfortunately, the success story does not include a chapter on synthetic fibre yarns and woven fabrics, for which separate figures are given. In 1954 exports were worth £40,055,000, and the volume was slightly above that in 1953, although still less than in 1950. But the best business was in the first quarter of the year, and thereafter it showed a steady decline.

Work Begins at Alderley

WORK has begun on the site at Alderley Park, Cheshire, where—as was announced some time ago—I.C.I. are establishing the headquarters of their pharmaceutical interests. The first buildings will be laboratories and offices designed by Manchester architects Harry S. Fairhurst & Son for the Biological and Chemical Research Departments of Imperial Chemical (Pharmaceutica's) Ltd. These departments are at present working at the headquarters of the I.C.I. Dyestuffs Division at Blackley, Manchester, and at Stamford Lodge, Morley. It is hoped that their new buildings will be completed in about two years. The main contractors are John Laing & Son.

With the completion of the present contract, approximately 300 biologists, chemists and other staff and workers will be employed at Alderley. Many of these will be transferred from the Blackley and Morley laboratories and offices.

The farmland that is not to be built on will be used for field trials with veterinary products developed in the laboratories. A high standard of agriculture will be maintained. Already trials with the intensive grazing of sheep are taking place. A programme of rehabilitation of the woodlands of the estate, designed to combine the preservation of the amenities and traditional landscape of the district with the practice of good forestry, has also begun. All these operations are being conducted so as to cause the minimum of disturbance to the wild life for which Radnor Mere is well known.

High UK Isotope Exports

BIRMINGHAM University is in October to start advanced courses in radioactivity and radiochemistry to give specialised training to those intending to use radio-isotopes in industry or medicine.

This was announced at the opening recently of the 'Atoms for Industry' exhibition at Birmingham Exchange and Engineering Centre. The exhibition is open until 26 February.

Opening it, Dr. Henry Seligman, Director of the Isotopes Division of the Atomic Energy Research Establishment at Harwell, said that Britain was now by far the largest exporter in the world of radioactive materials. British exports exceed the combined exports of all other countries. Output at present is at the rate of 20,000 consignments—worth £500,000—a year, of which more than 6,000 are being exported. Last year's output was 17,000 consignments.

Broadcast Appeal

An appeal on behalf of King George's House (John Benn Boys' Hostels Association) Stockwell, London S.W.9, will be broadcast on Sunday, 27 February at 8.25 p.m. on all Home Services of the BBC. Speaker will be Mr. Aubrey Townshend, M.B.E., who has been warden for 27 years. The House exists to provide a home for boys without homes in London and it is maintained entirely by the boys themselves with the aid of voluntary subscriptions.

The Export Situation

The Year Begins Quietly But Steadily

AS shown by the Board of Trade's 'Accounts relating to Trade & Navigation of the United Kingdom,' exports of chemical products during January remained apparently healthy. The month's total of £19,922,490 was below the record figure for December, £21,720,714, but the general pattern of trade remained unchanged, and on the whole it is possible to say that the improvements in Britain's export business are being maintained.

Trade with Canada continues to decline, unhappily, but the last few months have seen considerable expansion of business with the West Indies—no doubt due in large measure to the visit of HRH Princess Margaret. Exports to the Far East have increased.

Among commodities, aluminium oxide has made one of its periodical rises, and the coal tar products continue to exhibit their regular irregularities. After its meteoric rise, lead tetraethyl seems to have settled down to a steady prosperity, and this reflects the general situation—all quiet.

TABLE 1
VALUE OF EXPORTS IN £ : PRINCIPAL CUSTOMERS

	Jan. 1955	Dec. 1954	Jan. 1954
Gold Coast	389,814	443,203	280,935
Nigeria	455,364	429,797	360,147
South Africa	1,195,772	947,444	839,131
India	1,088,078	1,597,414	1,242,748
Pakistan	436,002	626,354	376,009
Singapore	344,486	395,441	288,835
Malaya	341,233	347,697	278,360
Ceylon	204,506	332,889	217,726
Hong Kong	299,117	356,383	367,027
Australia	1,657,519	1,978,351	1,418,614
New Zealand	726,843	582,032	431,303
Canada	455,282	629,012	560,623
Trinidad	279,595	283,893	123,245
Eire	626,034	520,065	551,426
Finland	282,328	248,456	213,175
Sweden	503,451	558,929	447,720
Norway	356,524	290,909	207,423
Denmark	371,106	352,361	308,768
Western Germany	403,698	385,847	325,230
Netherlands	682,441	635,478	696,351
Belgium	427,195	361,493	368,105
France	547,441	688,122	422,287
Switzerland	198,901	190,354	218,912
Italy	498,793	535,413	400,841
Egypt	269,020	355,584	288,676
Burma	206,512	120,474	138,212
China	247,100	168,680	85,407
Indonesia	119,409	424,897	153,283
US	702,637	747,085	524,742
Argentine	804,970	1,401,526	536,617
Total value of chemical exports	**19,922,490**	**21,720,714**	**16,401,055**

TABLE 2
VALUE OF EXPORTS IN £ : PRINCIPAL COMMODITIES

	Jan. 1955	Dec. 1954	Jan. 1954
Acids, inorganic	42,959	48,129	13,857
Copper sulphate	361,648	90,196	492,067
Sodium hydroxide	647,910	578,908	386,023
Sodium carbonate	210,322	151,899	135,069
Aluminium oxide	49,114	469	13,857
Aluminium sulphate	50,769	30,865	36,548
Ammonia	39,945	45,332	27,686
Bismuth compounds	27,154	37,543	39,868
Bleaching powder	53,959	45,436	25,050
Hydrosulphite	58,485	85,367	28,702
Calcium compounds, inorganic	60,627	49,821	50,772
Lead compounds, inorganic	37,698	38,572	26,973
Iron oxides	24,534	28,544	24,063
Magnesium compounds	52,510	70,038	64,781
Nickel salts	45,556	44,683	53,458
Sodium silicate	30,431	20,928	28,361
Glycerol	22,564	26,555	67,037
Ethyl, methyl, etc., alcohols	130,879	131,332	170,507
Acetone	37,241	45,127	87,637
Citric acid	26,886	31,398	22,702
Dyestuffs intermediates	140,858	181,088	96,285
Total for chemical elements and compounds	**4,694,717**		**4,491,854**
Coal tar	207,832	73,870	59,642
Cresylic acids	57,494	88,667	35,986
Creosote oil	40,385	221,220	154,490
Total for tar products	**365,302**	**440,950**	**266,352**
Indigo, synthetic	52,567	118,147	84,037
Total for synthetic dyestuffs	**889,054**	**1,674,510**	**980,502**
Total from paints, pigments and tannins	**1,769,164**	**1,893,731**	**1,509,453**
Medicinal and pharmaceutical products, total	**3,295,517**	**3,465,090**	**2,713,485**
Essential oils :			
Natural	42,415	53,234	40,113
Synthetic	98,881	124,017	89,329
Flavouring sesences	97,850	100,598	86,622
Total for essential oils, perfumes, etc.	**1,900,199**	**1,893,731**	**1,597,292**
Ammonium nitrate	36,629	29,557	84,734
Ammonium sulphate	557,910	754,334	318,859
Total for all fertilisers	**671,810**	**863,631**	**494,141**
Plastics materials, total	**2,038,146**	**2,527,242**	**1,649,821**
Lead tetraethyl	647,403	644,208	291,715

Fire at Shell Haven

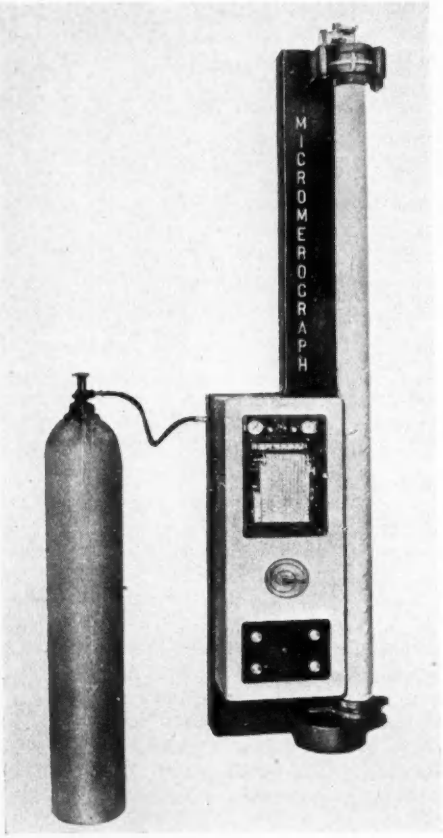
Fire broke out early on the morning of Wednesday, 23 February, at Shell Haven, involving seven tanks of naphthalene and spirit.

Size Distribution Analysis

New Sharples Instrument

SHARPLES Centrifuges Ltd., of Tower House, Woodchester, Stroud, Gloucestershire, announce that the Sharples Micromerograph is now available for sale in the UK and Europe. The Micromerograph is manufactured in Philadelphia, and had previously only been available for sale within the US. Giving a reproducible particle size distribution analysis, it is a self recording, sedimentation balance type instrument.

Determination of the particle size distribution of a powder requires deagglomeration of the sample into discrete separated particles. The Micromerograph accomplishes this by projecting the powder sample through a deagglomerator with a burst of compressed dry nitrogen. The nitrogen pressure and the orifice are adjusted for the particular powdered material being analysed. The sample ejected from the deagglomerator forms a small cloud near the top of the sedimentation column.



The particles fall at their terminal velocities until stopped by the pan of the servo-electronic balance at the bottom of the column. Slight differences in time of fall due to the finite size of the initial particle cloud are rendered unimportant by the relatively great length (220 cm.) of the sedimentation column. The time required is from a few seconds to three hours depending on the size distribution and density of the particles.

As the particles accumulate on the balance pan, a slight rotation of the balance beam on its torsion suspension occurs. A sensing device incorporated in the balance applies a signal to the electronic system of the instrument which, in turn, applies a current to a restoring force coil on the balance beam. The current required to keep the beam balanced is a continuous measure of the accumulated weight of powder on the balance pan.

The milliammeter of the moving chart recorder is actuated by the same current that counter-balances the weight of the powder on the balance pan. The resulting chart is a record of accumulated weight vs. time. A determination is complete when the chart line becomes straight, although for many applications it is satisfactory to discontinue the run at an arbitrary time, at an arbitrary slope on the curve, or at some approximate percentage of total sedimentation.

Interpretation of Results

Through Stokes' Law of Fall, the various times required for any particular percentage of the powder to settle are inversely proportional to the square of the particle size in microns and to the density. The information on the chart is used to obtain a complete particle size distribution curve showing the percentage weight of particles smaller than any given micron size.

The Micromerograph is ideally suited for keeping the particle size distribution of powders within safe or acceptable limits. Limits once having been established, non-technical operators can quickly check a size distribution curve against a transparent overlay showing the area of acceptability. The chart and the derived particle size distribution curve form permanent records for future reference.

Photometric Methods of Analysis

A Survey of Recent Methods

THREE new procedures for the determination of boron using curcumin have been proposed[1], and the mechanism of the colour reaction has been discussed. The methods described are suitable for 0.03-1.00 μg. amounts. A simplified curcumin procedure has been used for boron in soils[2], and 1 : 1′-dianthrimide has been used similarly for amounts of the order of 0.3 ppm. Separation of the boron by distillation of the methyl ester prior to application of dianthrimide for boron in mineral fertilisers has been discussed by others[3]. The same technique has also been used for boron in titanium alloys[4].

Sodium alizarinsulphonate[5], quinalizarin[6] and carmine[7] have been used for the determination of boron and a new procedure based on the use of tetrabromochrysazin has been proposed[8].

Ti & Mo

Titanium has been determined photometrically in clays and refractory materials by a standard peroxide procedure[9] and chromotropic acid has been used similarly for its determination in pig iron, steels, etc[10]. Differential absorptiometry with peroxide as the colour forming agent was used for titanium in alloys with uranium by Milner and Phennah[11]. The classical thiocyanate procedure has been used for molybdenum in plant tissue[12] and has been extensively examined by Crouthamel and Johnson[13].

Zinc

Zinc has been determined in blood plasma and serum using dithizone in a monophase of 2-methoxyethanol/water[14] and in biological preparations[15]. Others[16] have used the indo-oxine reaction for determining zinc in the concentration range 0.1-100 μg. per ml. An accuracy of ± 1 per cent is claimed for this method providing the *p*H conditions specified are followed. These vary with the amount of zinc being determined (e.g. *p*H 7.54 for 0.1-1.0 μg. per ml., but *p*H 3.95 for 10-100 μg. per ml.). Rush and Yoe[17] have proposed the use of 2-carboxy-2′-hydroxy-5′-sulphoformazyl benzene at *p*H 9 for the determination of zinc. The absorption of the solution was measured at 620 mμ against a standard reagent blank. This new reagent has been given the trivial name 'Zincon' by the authors who also advocate its use for the determination of copper by colour development at *p*H 5.2, measuring the absorption at 620 mμ.

Tin

Application of the 'dithiol' method to determination of tin in biological materials has been examined by Farnsworth and Pekola[18] and a new method involving extraction of the diethyldithiocarbamate of tin with chloroform has been outlined for copper alloys containing 5 per cent Sn, by Davis and Easton[19]. Copper was removed by a diammonium diethyldithiocarbamate extraction with chloroform from acid solution before applying the dithiol procedure for tin by Dickinson and Holt[20]. The intense colour of stannic bromide in concentrated hydrobromic acid has been used for photometric determination of tin[21], but although small amounts of phosphoric acid may be tolerated, other common mineral acids interfere.

Phosphorus

As usual, the absorptiometric determination of phosphorus has received widespread attention during 1954. Variations of the usual molybdenum-blue method have been published[22-27], while extraction of the phosphomolybdic acid into organic solvents and photometric measurement without reduction has been preferred by others[28,29]. The absorption of molybdovanadophosphoric acid was used for determining phosphorus in silicate rocks[30]. Hexametaphosphate may be determined photometrically by its decolorising action on ferric thiocyanate[31].

Uranium

Uranium has been determined by photometric measurement of the salicylamide[32] complex at 430-440μ (*p*H 6.6-7.2). Fluoriphotometric measurement has been used for uranium in concentrates[33], and in rocks and minerals[34]. In the latter case the fluorimetric method was preferred to using dibenzoylmethane. Rao and Rao[35] compared the use of R-salt and nitroso-R-salt for the

spectrophotometric determination of uranium. The latter gives a deeper colour but it is less sensitive and subject to more interference than the former reagent. Quercetin has been used by Komenda[36]. Colour measurement is made at *p*H 7, and iron and other metals reacting with quercetin must be absent.

Silicon

Silicon has been determined colorimetrically by the molybdenum blue method[27,37-39]. Others have measured the absorbance of the yellow silicomolybdic acid without extraction[40], and after extraction into an immiscible solvent[29].

Arsenic

Arsenic has been determined by measurement of the yellow molybdoarsenic acid complex after extraction[29] and by the molybdenum blue method following distillation as arsine[41], and after ashing of biological materials with magnesium nitrate and distillation[42]. Measurement of the yellow molybdovanadoarsenic acid has also been used[43].

V, W & Mo

Vanadium was determined by Japanese workers after extraction of its oxinate with pentanol[44]. An indirect method[45] based on the reduction of ferric iron by V^{++++} and reaction of the Fe^{++} thus formed with 1:10-phenanthroline has been used for vanadium in steels, and the use of silver peroxide in the colorimetric determination of vanadium has also been discussed[46]. The colour of tungstovanado-phosphoric acid was used for determining tungsten[43] and the spectrophotometric determination of tungsten and molybdenum by the thiocyanate method has been studied extensively[47].

Aluminium

Aluminium has been determined in titanium alloys by the aluminon method after a cupferron separation[48] and in zinc[49], masking the interference of iron, copper and tin with thioglycollic acid. Eriochrome cyanine[50] may be used for aluminium in clays and refractory materials and oxine for its determination in steel[51,52,53]. In the latter instance the bulk of iron was removed by extraction of ferric thiocyanate with an ether-tetrahydrofuran mixture from strongly acid solution. The alizarin method for traces of aluminium in zinc has been improved by Russian workers[54] through extraction of the excess reagent with ether. The colorimetric determination of aluminium in steels using stilbazo as reagent has been studied[55].

Calcium

Calcium was determined nephelometrically in titanium alloys as its stearate after separation of the titanium by extraction of the cupferrate with chloroform[56]. The chloranilic acid method has been used for calcium in blood[57]. Chloranilic acid was also used for the photometric determination of Sr in pure solution only[58]. Ethyl methyl picrate has been proposed by Caley and Moore[59] for the determination of barium.

Magnesium

Thiazole yellow has been used by several authors for the determination of magnesium[60,61] and it has been found preferable to titan yellow by some because it covers a wider range of magnesium concentrations[62]. For titanium metal, Challis and Wood[63] used titan yellow to determine magnesium impurity after removal of the titanium by cupferron/chloroform extraction. Solochrome Cyanine R.200 was used for the colorimetric determination of magnesium in titanium alloys. Luke and Campbell[64] extracted the magnesium oxinate into chloroform to determine its presence in electronic nickel. Various interfering elements were first of all removed by hydroxide, oxalate, sulphide precipitation, etc. McAllister[65] precipitated magnesium with oxine, redissolved the precipitate in acid and developed a colour system by coupling the oxine with 4-aminophenazone and oxidising the product with ferricyanide in alkaline solution.

Potassium

The dipicrylamine method for potassium has been subjected to further examination by Gastinger[66], but otherwise little attention seems to have been paid to the absorptiometric determination of the alkali metals during the period covered by this report.

Beryllium

Aluminon[67] has been used for the colorimetric determination of beryllium in copper alloys after precipitation of the beryllium with guanidine carbonate. Colorimetric methods for beryllium have been reviewed by American workers[68].

Niobium & Tantalum

The thiocyanate method has been applied for niobium in tantalum and its oxide[69], and Milner and Smales have analysed low grade African minerals, etc., by a similar procedure[70] while Marzys[71] has also utilised the method for low grade niobium ores. The former workers have extended the thiocyanate method to determining niobium in steels[72] while others effected concentration of niobium by ether extraction of the thiocyanate before measuring its transmittancy[73]. Norwitz and Codell[74] evolved a molybdenum blue method for niobium in titanium alloys. A simultaneous method for tantalum and niobium (after chromatographic separation from other elements) which uses pyrogallol has been described by Hunt and Wells[75]. Applications of the pyrogallol method for determining tantalum in titanium have been published[76].

Nickel

Russian authors[77] have reported on the use of α-furyldioxime for the gravimetric and colorimetric determination of nickel. The compound extracts well into benzene or chloroform at *p*H 7.3-8.4. Gillis and coworkers[78] have used heptoxime (cycloheptanedionedioxime) for the colorimetric determination of nickel in the range 1-10μg. The yellow complex, precipitated from acid solution, is much more soluble in chloroform than the nickel-dimethylglyoxime compound, and the extraction is quantitative over a wide *p*H range (3.8-11.7). Cobalt (II), copper (II) and iron (II) are the only metals to yield extractable heptoximates, but these can be controlled by addition of thiosulphate. The use of 2-nitroso-1-naphthol-4-sulphonic acid for the spectrophotometric determination of nickel has been proposed[79].

Manganese

Oxidation to permanganate has been used conventionally for determining manganese in water[80] and in soil extracts[81].

Chromium

Chromium has been determined absorptiometrically by use of *sym.*-diphenylcarbazide. The complex may be concentrated by extraction into isopentanol where its absorbance may be measured at the same wavelength as in aqueous solution[82]. Bose[83] has made intensive investigations into the colour reaction between chromium (VI) and diphenylcarbazide. Other workers have more simply made use of the fairly intense colour of the trivalent chromium ion to evolve a simple and rapid photometric method for the determination of this metal in alloy steel and bronze[84].

Ce, Y & Rare Earths

Small amounts of cerium in uranium have been determined by measuring the absorbancy due to the Ce^{++++} ion after extraction of UO_2^{++} and Fe^{+++}, etc., as thiocyanates. A correction is necessary for manganese if present[85]. A new colorimetric method[86] based on the red-bown colour of the Ce (IV) cupferron complex extracted from 0.15 N acid by isopentyl or *n*-butyl acetate has been published. 10-120 μg. amounts of rare earths and 8-80 μg. of yttrium may be determined spectrophotometrically in aqueous solution by alizarin red-S, with, it is claimed, a 100-fold increase in sensitivity over existing methods for determining these elements[87]. Against this must be set the non specific nature of the reagent. It is, however, valuable when used in conjunction with chromatographic separation of these metals from others.

Tellurium

Brown[88] has published a rapid method for the absorptiometric determination of tellurium in its alloy with lead. The method involves deposition of elemental tellurium and measurement of the red-yellow iodo-tellurate colour after addition of iodide ions. Scott and Leonard[89] have described the photometric determination of telluric acid in ammonia solution.

Thorium

Indian workers[90] have used oxalohydroxamic acid for the indirect colorimetric determination of thorium via the ferric hydroxamic acid complex.

Antimony

The methyl violet method of Gotô and Kakita for the determination of antimony has been modified by Jean[91] to overcome the tendency for free methyl violet to extract along with the complex. A new photometric method for antimony uses the intense yellow colour produced by concentrated hydrobromic acid[92]. The method is easily vitiated by the presence of other mineral

acids. Rhodamine B has been used for antimony in rocks and soils[93].

Bismuth

Measurement of the absorption of the bismuth-KBr complex at 365 mμ has been used for determination of this metal in metallic lead. Fairly large amounts of most of the common metals do not interfere[94]. The well known thiourea method for bismuth has been re-examined by Nielsch and Böltz[95]. The effects caused by variation in time, temperature, presence of foreign ions and reagent concentration, etc., have been thoroughly investigated. Another worker[96] selected the thiourea reagent for determining bismuth in its alloys because most other elements commonly present do not interfere with the photometric determination. The method preferred by another for determination of traces of bismuth in lead and in copper depends on the intense yellow colour of the bismuth iodide complex[97]; nephelometric determination was effected with cinchonine iodobismuthite.

Germanium

Germanium has been determined photometrically with phenylfluorone after isolation of germanium by extraction from 8-9 M hydrochloric acid with carbon tetrachloride. The authors[98] used phenylfluorone rather than reduced haematoxylin, because it was more sensitive and did not require the use of a buffered solution. A fluorimetric method for germanium using resacetophenone in glacial acetic acid/phosphoric acid has been proposed[99] for the detection and determination of this element. Unfortunatel, several common anions *viz.* NO_3', NO_2', F' and CrO_4'' quench the fluorescence. Luke and Campbell[100] have discussed the determination of many impurities in elemental germanium.

Gallium

Bradacs, Feigl and Hecht[101] determined gallium in trace amounts in minerals, water, etc., by measuring the fluorescence of the cupferron-morin complex of the element in a chloroform extract.

Cadmium

A fluorimetric method for cadmium has also been put forward[102]. This method depends on the fluorescence of the complex formed with 2-(*o*-hydroxyphenyl)benzoxazole after precipitation of the same and solution in glacial acetic acid. The precipitation is carried out at *p*H 11, and one would expect that this method would be subject to considerable interference from many cations.

Mercury

The ultra-violet spectrophotometric determination of mercury as its thiocyanate complex has been described[103]. The complex was isolated after extraction into *n*-butanol and generally speaking there appears to be little interference from other common ions, unless these are present in high concentrations. Errors in the UV absorptiometric method of Zuehlke and Ballard (*Brit. Abstr. C.*, 1950, 477) for mercury, due to the presence of organic materials, have been accounted for by others[104]. The Irving reversion technique with dithizone has been used for determining mercury in paper and pulp, etc.[105].

Iron

Iron has been determined photometrically with dimethylglyoxime[106] in copper alloys without taking drillings, in organic compounds by diethylammonium diethyldithiocarbamate[107], in soil analysis by sulphosalicylic acid[108], in acid solution as ferrous cyclohexanedianedioxime[109], in the presence of vanadium, chromium, manganese, nickel and zinc with *o*-phenanthroline by extraction of the perchlorate salt of the complex into chloroform. The other metals react with the phenanthroline much more slowly, so that the extraction procedure allows a clean separation and determination of the iron in the presence of these other metals[110]. Iron has also been determined photometrically, with *o*-phenanthroline in elemental tantalum[111], by two new reagents 2-(2-pyridyl) benziminazole and 2-(2-pyridyl) iminazoline[112], with sulphosalicylic acid in clays[9], by new methods in which the absorbance of the tartrate complex is measured at *ca.* 390 mμ[113], the isonitrosoacetoacetate ferrous complex is used at *p*H 7.8 in a boric acid buffer[114], and the absorption of the meconic acid-ferric iron complex is measured at 457 mμ[115]. The classical thiocyanate method has been applied to the determination of serum iron[116].

Copper

Copper has been determined photometrically with 4:4′-diethyl-2:2′-diquinolyl (2:2′-dilepidine). The molecular extinction is 12.7 per cent greater than that of cuproine

itself and the copper complex is less soluble in isopentanol, both by partition from water and simple solution in the solvent[117]. The rubeanic acid method has been studied[118] and used for the determination of copper in OFHC copper by a combined electrolytic-colorimetric method[119], and for copper in soils[51]. Xylene has been used by Chow[120] to extract copper diethyldithiocarbamate in the analysis of sea water. The reagent was used instead of dithizone because of improved sensitivity, accuracy and freedom from interference. Chloroform was used as the solvent medium by Wyatt[107] and by Jenkins[121] in a method for trace copper in highly purified water.

Chilton[122] has modified his original method[123] to allow the determination of copper in the presence of uranyl ion by the diethyldithiocarbamate procedure. Jean[124] eliminated interference from nickel by carrying out the measurement in alkaline tartrate medium. Cluley[125] used complexone III to maintain iron, cobalt, nickel in aqueous solution while extracting the copper diethyldithiocarbamate with chloroform. The only common interfering metal not masked by EDTA is bismuth, but this can be accounted for by cyanide treatment of the extract. Abbott and Polhill[126] used dibenzyldithiocarbamate and carbon tetrachloride for the determination of copper in oils and fats. The diethyldithiocarbamate method has also been used for copper in cerebral tissue[127] and in elemental tantalum and its oxide. Williams and Morgan[128] proposed *bis*-cyclohexanoneoxalyldihydrazone for the determination of copper in plants, reporting no appreciable interference from other normal constituents of plant materials. The absorption due to the bromide in hydrobromic acid solution has been advocated as a practical basis for determination[129] and simple measurement of the sulphate and nitrate has also been described[130]. The pyridine thiocyanate procedure has been used for the analysis of copper in meteorites[131].

Zirconium

Zirconium has been determined by photometric measurement of the absorbancy of the yellow colour formed with quercetin in 0.5N hydrochloric acid and the maximum tolerable amounts of various ions were established[132]. A turbidimetric method based on the use of phthalic acid has been described. The method appears to be successful for the determination of zirconium in the presence of high concentrations of other ions[133].

Platinum Metals

Platinum was determined by measurement of the absorption of the $PtCl_6''$ ion at 262 mμ by Kirkland and Yoe. The method differentiates between $PtCl_4''$ and $PtCl_6''$ since the former shows negligible absorbance at 262 mμ[134].

The same authors have proposed dimethyl-*p*-nitrosoaniline as a sensitive reagent for the separation and colorimetric determination of platinum and palladium[135,136]. The other platinum metals and high concentrations of gold and some transition elements interfere seriously. Fraser, Beamish and McBryde[137] have described a procedure for the separation of palladium from lead and have used potassium iodide.

Absorptiometric determination of iridium and rhodium[138] has been described. The iridium was oxidised with ceric sulphate and the absorbance was measured at 510 mμ while the rhodium was reduced subsequently with stannous chloride and measured similarly. Separation of palladium from platinum and gold by extraction with dimethylglyoxime and chloroform and photometric determination of the palladium in the organic phase has been described by Nielsch[139].

Cobalt

Cobalt has been determined by the nitroso-R-salt method in steels[140] and has been used in the recommended absorptiometric procedure of the British Standards Institution[141], for cobalt in steels. The nitroso-R-salt reagent has been further studied by Burriel and Gallego[142] and has been applied to the analysis of cobalt in blood serum, etc.[143]. The use of diethyldithiocarbamate for the simultaneous determination of copper, nickel and cobalt[122,123] has been advocated and the reagent has also been used in ethyl acetate to extract cobalt from aqueous solution, holding nickel, etc., in the aqueous phase by means of complexones[144]. Others have used a complexone itself (nitrilotriacetic acid) for the colorimetric determination of cobalt between *p*H 4.88-5.69 particularly in cobalt rich alloys[145]. Kinnunen and coworkers[146] used the classical thiocyanate procedure to evolve a method for cobalt in metallurgical products, while others[147] measured the absorbance due to cobalt sulphate for the analysis of ores.

Silver

The photometric determination of silver with *p*-dimethylaminobenzylidinerhodanine has been discussed[148] and also the influence of hydrogen ion concentration on the formation of indium dithizonate[149] with particular reference to separation of indium from the noble metals, zinc and cadmium.

Sulphur

Several photometric determinations of sulphur and its compounds have been reported. Noteworthy among these is the method of Zimmer for determining carbon disulphide based on xanthate formation and reaction of the latter with molybdate[150] and that of Jones and Letham[151] for the indirect sub-micro determination of sulphate with 4-amino-4′-chlorodiphenyl in the ultra-violet region. Sulphate has been determined turbidimetrically with barium[27] and elemental sulphur in hydrocarbons after separation of combined sulphur[152].

Fluorine has been determined by variations of the usual methods, e.g. by bleaching of the zirconium-alizarin lake, in phosphates[153] and in waters and soil extracts[154]; by bleaching of the ferric-5-phenylsalicyclic acid complex, also in the analysis of water[155]; and by means of thorium nitrate-amaranth on filter paper[155], measuring the liberated free amaranth at 521 mμ. Sulphate, phosphate, bicarbonate, hydrogen ion, aluminium and ferric iron all interfere seriously with the method.

Bromide was determined in the presence of chloride by oxidation to bromate, liberation of bromine and reaction of the latter with decolorised rosaniline, measuring the tetrabromorosaniline absorptiometrically at 570 mμ[157].

The Palin method for free chlorine, chloramine, dichloramine and nitrogen trichloride in water using *o*-tolidine has recently been reviewed[158]. A new method for chlorine in water based on the oxidation of 3:5-dimethylnaphthidine has been proposed by Belcher, Nutten and Stephen[159]. The method is suitable for 0.05-1 ppm. of chlorine. Chlorine dioxide has been determined similarly with tyrosine[160] and perchloric and chloric acids by reduction and turbidimetric measurement with silver ions[161].

Cyanide

Cyanide has been determined indirectly through the colour reaction of mercuric ions with *p*-dimethylaminobenzylidenerhodanine, using a diffusion technique for separation of the cyanide from other ions[162], and by the pyridine-pyrazolone method[163] in waters and waste samples.

Nitrogen

An unusual method for the rapid photometric determination of nitrate and nitrite has been outlined[164], and methods for hydrogen peroxide[165], and oxygen in ethylene[166] and water[167].

Organic Analysis

Colorimetric methods have been proposed for the determination of oestrone, oestriol and oestradiol[168], cholesterol[169] and unsaturated steroids[170] (using ferric chloride). Colorimetric or turbidimetric methods have been devised for citric and *cis*-aconitic acids[171], pyridine-2:5-dicarboxylic acids[172], acetylsalicylic and salicylic acid[173], salicylates[174], trichloroacetic acid [175], salicylhydroxamic acid[176], *p*-aminohippuric acid[177] and carbamyl-amino acids[178].

Methods for the colorimetric determination of sugars and allied compounds are numerous. Typical methods are those for glucose and fructose[179], glucose in the presence of fructose[180], glucosamine[181], hexose phosphate[182] and diphosphates[183], sucrose and inulin[184], aldopentoses, aldohexoses, methylated sugars and disaccharides[185].

The spectrophotometric determination of morphine and codeine[186], and of atropine sulphate[187] has been investigated.

Methods for the colorimetric determination of glycerol have been reviewed and oxidation by periodate, with subsequent determination of the formaldehyde, was selected as the most suitable[188]. Others have used the reduction of dichromate in sulphuric acid by glycerol and reaction of the trivalent chromium produced with *sym.*-diphenylcarbazide for the same determination[189]. Vicinal glycols have been determined by reduction of periodate and spectrophotometric determination of the amount of the latter remaining after reaction[190].

Anionic detergents[191], non-ionic detergents[192] and quaternary ammonium compounds[193] have been determined absorptiometrically. Use has been made of the intense colour of the cobalt (III) and chromium (III) complexes for the purpose of determining ethylenediaminetetra-acetic acid[194,195].

The spectrophotometric determination of

total penicillins by conversion of penicillenic acid[196], the simultaneous determination of penicillin and penicilloic acid[197] and of procaine benzylpenicillin[198] have been reported.

Absorptiometric methods have been used for the determination of several vitamins, e.g. tocopherol[199] (fat soluble vitamin E), ascorbic acid[200] and vitamins D in the presence of vitamin A[201]. The colorimetric determination of phenol oxidase[202], cytochrome-C-oxidase[203] and choline dehydrogenase[204] and of many other enzymes has been reported, but these cannot be dealt with further here.

Glyoxal has been determined colorimetrically through its reaction with 2:3-diaminophenazine[205], propionaldehyde by the ninhydrin reaction[206], phenylacetone[207] by measurement at *ca.* 260 mμ, and acetylacetone by reaction with ferric ions[208].

Urea has been determined colorimetrically by the reaction with *p*-dimethylaminobenzaldehyde[209] and propylthiouracil by reaction of the thioureido group with ruthenium trichloride[210]. 4-Aminoantipyrine reacts with guaiacol to form a chloroform extractable dye, thus furnishing a method for determination of this phenol in the presence of others such as catechol[211]. New colorimetric methods have been proposed for determining vanillin[212].

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[continued on page 542

Sulphurous Materials

OEEC Report on Position for Six Months 1954

AN OEEC report, just received, is the third of aseries dealing with developments in the sulphurous raw materials position. The first, which dealt with the situation in 1952, was published in THE CHEMICAL AGE, 1953, **69**, 555, and the second, which dealt with the position during the first six months of 1953 was published in 1954, **70**, 417.

The present report is the last of the series, the committee having decided to study the sulphur situation at yearly intervals in future, and to incorporate the report drawn up in the annual report on the situation in the chemical industry. This procedure has already been adopted for the report on the sulphurous raw materials position in 1953, which is given as an appendix to the publication 'The Chemical Industry in Europe' (THE CHEMICAL AGE, 1955, **71**, 127).

Sulphurous Raw Materials

Developments in production in OEEC countries and a comparison with production in the United States are given in the following table (in 1,000 metric tons):

	Output in OEEC Countries			United States Output Jan.-June 1954	OEEC Production in 1st. half 1954 as percentage of US Production
	1953	July-Dec. 1954	Jan.-June or Decrease (per cent)		
Native sulphur	123.5	102.7	−17	2,788	3.7
Recovered sulphur	127.8	131	+ 2.5	180	72.8
Total	251.3	233.7	− 7	2,968	7.9

Production of native sulphur in OEEC countries, now 25 per cent below the peak output in July-September 1952, is falling, due to the decline in Italian production. Recovery of sulphur has, however, reached the highest level yet reported in replies to the OEEC questionnaire.

The following tables show consumption of sulphur as such in OEEC countries and in the United States and the relative importance of the principal uses to which sulphur is put:

	Consumption in OEEC Countries			United States Consumption (in 1000 metric tons)	Consumption of OEEC Countries as percentage of US Consumption
	1000 metric tons	Increase or Decrease over 1st half 1953 (per cent)	Increase or Decrease over 2nd half 1953 (per cent)		
1st half 1953	415.3	—	—	—	—
2nd half 1953	395.4	− 4.8	—	—	—
1st half 1954	483.6	+16.5	+22.3	2,133.6	22.7

Percentage of Sulphur Used for Certain Purposes

	OEEC Countries			United States
	Jan.-June 1953	July-Dec. 1953	Jan.-June 1954	Jan.-June 1954
Sulphuric acid ..	39	38	35	76
SO_2 ..	15	17	13	10
CS_2 ..	26	29	26	5
Agricultural uses ..	13	6	17	5
Other uses	7	10	9	4

Consumption of sulphur in OEEC countries, though lower than a few years ago, has increased considerably compared with the last two half yearly periods. As the table giving the relative importance of the principal uses of sulphur shows, the percentage of sulphur put to agricultural use in OEEC countries has risen most, due to the wet summer in 1954. Carbon disulphide consumption has increased also, regaining the 1951 level. This is probably due to the revival of activity in the textile industry.

The gross sulphur deficit in member countries in the first six months of 1954 amounted to 483,600 − 233,700 = 249,900 tons. If exports to non-member countries are deducted (41,800 tons) it will be seen that the net deficit was 291,700 tons.

Imports from the United States during the first half of 1954 (334,800 tons) were more than double imports in the second half of 1953 and had nearly regained the 1949-50 level. Imports from other countries, only 10 per cent of the total, have remained relatively stable during the last year.

The table overleaf shows the trend in the pyrites situation in member countries.

and compares the figures for these countries and for the United States in the first half of 1954, in 1,000 metric tons of sulphur content:

	Production	Increase or Decrease (per cent)	Consumption	Increase or Decrease (per cent)
Member Countries—				
July-Dec. 1953	873.8	—	1,274.9	—
Jan.-June 1954	831.5	−5	1,364	+7
United States—				
Jan.-June 1954	224	—	274	—
As per cent of OEEC countries ..	27	—	20	—

Production of pyrites has been maintained at the average level of the last two years, despite a decline compared with the second half of 1953. The two countries showing the largest decrease are Greece, where production in the latter half of 1953 was abnormally high, and Portugal where there has been a continuous reduction in output since 1952. Consumption, however, was higher than at any period recorded in replies to OEEC questionnaires.

Imports were 27 per cent higher than in the second half of 1953, imports from non-member countries having increased more than imports from member countries. Exports, however, increased by only 6 per cent. It will be noted that member countries imported 97,600 metric tons of sulphur as pyrites from overseas territories (there were no exports to overseas territories). Imports from metropolitan member countries amounted to 313,700 metric tons compared with an export of 215,300 metric tons.

The trend in the situation with regard to blendes in OEEC countries is shown in the following table (in 1,000 metric tons of sulphur content):

	Production	Increase or Decrease over 2nd half 1953 (per cent)	Consumption	Increase or Decrease over 2nd half 1953 (per cent)
July-Dec. 1953	68.7	—	191.2	—
Jan.-June 1954	69.4	+1	205.6	+7.5

The following table shows the situation for sulphur in all other forms (in 1,000 metric tons of sulphur content).

	Production July-Dec. 1953	Production Jan.-June 1954	Increase or Decrease (per cent)	Consumption July-Dec. 1953	Consumption Jan.-June 1954	Increase or Decrease (per cent)
Anhydrite*	160.6	168.2	+ 5	157.6	167.6	+ 6
Spent oxide ..	107.6	106	− 1	105.1	100.7	− 4
Mining wastes ..	27.3	20.5	−25	27.3	20.5	−25

* Production of anhydrite for the manufacture of ammonium sulphate and sulphuric acid only.

One noteworthy feature of the situation for other sulphurous raw materials is the increase in production and consumption of anhydrite in Greece, where figures for the first six months of 1954 are more than double those of the previous period.

Total production of sulphur materials by member countries during the first half of 1954 was 4 per cent lower than in the second half of 1953, whereas consumption was 9 per cent higher. The increase in consumption, by tonnage, was almost identical for sulphur and pyrites, the consumption of other sulphurous materials having remained relatively stable. Imports were nearly 40 per cent higher in the first six months of 1954 than during the previous half year, imports from non-member countries increasing by 60 per cent compared with an increase of about 15 per cent for member countries. The increase in exports was, however, only 4 per cent.

Sulphuric Acid

The position in member countries is given in the following table in 1,000 metric tons 100 per cent acid:

	Production	Increase or Decrease (per cent)	Consumption	Increase or Decrease (per cent)
July-Dec. 1953	4,656.6	—	4,678.6	—
Jan.-June 1954	5,022.2	+7.8	5,024	+7.4

Production of sulphuric acid during the first six months of 1954 amounted to approximately 65 per cent of the United States production.

The following table compares the principal uses to which sulphuric acid was put during the last three six-monthly periods and also gives similar information for the United States for the first six months of 1954 (percentages):

	Member Countries Jan.-June 1953	Member Countries July-Dec. 1953	Member Countries Jan.-June 1954	United States Jan.-June 1954
Fertilisers	57	54	55	39
Textiles ..	10	11	11	4
Metallurgy	4	4	4	7
Other uses	29	31	30	50



PAPER CHROMATOGRAPHY. By F. Cramer, transl. by L. Richards. Macmillan & Co. Ltd., London & New York. 1954. Pp. xii + 124, Plates IV. 25s.

Many workers in the field of chromatography will already be familiar with the original text of the 1st or 2nd German editions of this book. It is a little unfortunate that there has been such a time-lag in the process of translation that the appearance of this English version of the 2nd edition only just pre-dates the appearance of the 3rd German edition.

Here we have a collection of most valuable information, and the book is essentially a laboratory aid, theoretical discussion being severely limited. General methods of partition chromatography (within which term the author includes an introduction to electrophoresis) and specific applications to such particular problems as the separation of sugars and of amino acids are both fully covered. The discussion of the practice of this technique is comprehensive on the organic side, thought the literature on inorganic separations is less thoroughly presented.

The book is so valuable that its flaws stand out all the more strongly by comparison and tend, in truth, to be a trifle irritating. The portions in small type are not always well chosen, and the lay-out is at times confusing, as, for example, in listing suitable brands of papers, where English, German and American types are not clearly delinated into well-defined groups. Illustrations are numerous, but no reference can be found in the text to some of them, and others of them are separated from their textual background. Often a lengthy legend is given which would more appropriately have been given in the main text, but there is no consistency in this respect. Nor is there consistency in the listing of references, which are sometimes simply given as author's names in brackets, and at others as numbered references to the bibliography.

The translation is too often woolly and Germanic in construction, and there are times when the impression is gained that the translator is none too familiar with the chemical background of the subject, as, for example, when he uses the terms 'carotin,' 'Amberlits,' and the German names of dyestuffs, and when, in the bibliography, he lists Professor Linstead's name as 'R. P. Lindstaedt' on one line, and as 'R. P. Linstaedt' three lines later.

While such matters are regrettable, they should not, and will not, prevent the book from achieving wide currency as a reference book on all matters connected wth the practice of partition chromatography.—CECIL L. WILSON.

FLUID DYNAMICS & HEAT TRANSFER. By J. G. Knudsen & D. L. Katz. Michigan University Press; Geoffrey Cumberlege, London. 1954. Pp. ix + 243. 36s.

This book provides a relatively advanced treatment of the subject: it is particularly valuable in bringing together much new information and, in fact, provides a comprehensive survey of the literature.

The major portion of the book is devoted to fluid mechanics (169 pages) and the remainder to convectional heat transfer. Fluid flow in tubes (both rough and smooth), in annuli, in non-circular conduits, between plates and past immersed objects, is dealt with, as well as flow perpendicular to banks of tubes and in baffled heat exchangers. The mechanism of flow is discussed, involving a consideration of velocity profiles and boundary layers, and equations and plots are provided which are useful in predicting velocity profiles for the different types of flow considered.

The energy losses associated with fluid flow are considered in part II and this deals with laminar and turbulent flow in tubes, annuli, annuli containing fintubes, non-circular conduits, and also the resistance to flow offered by immersed bodies of different

shapes. Flow perpendicular to banks of tubes is also considered from the point of view of friction factors and energy loss.

In part III, heat transfer by convection is discussed and the analogy between heat transfer and momentum transfer is used to predict rates of heat transfer from the energy loss and the flow mechanism. Empirical correlations of experimental data on convection are discussed and also the Chilton and Colburn 'j factors,' for expressing mass-transfer and heat-transfer coefficients.

Recent work on the calculation of heat transfer coefficients from velocity profiles is presented and a section deals with liquid metals as heat-transfer media. These are of considerable importance in the nuclear energy field, but recent work indicates that the usual empirical equations cannot be used to predict heat transfer coefficients for liquid metals. The more fundamental approach involving their calculation from velocity profiles thus becomes of considerable importance in this case.

This book performs a valuable service in bringing together the results of research in the fields of both fluid dynamics and of heat transfer. It will prove useful to the advanced or research student working in these fields and also to those engaged in design work who require an up-to-date survey of recent research.—R.L.

Drug Prices Criticised

Value of Exports Stressed

CRITICISMS were expressed in the House of Commons on 16 February of the prices of drugs prescribed under the National Health Service. The prices charged by manufacturers for many drugs were excessive, it was claimed during a debate on Supplementary Health Service Estimates.

The Minister of Health, Mr. Iain Macleod, said that an investigation into the secondary manufacture and compounding of drugs led to the view that no excessive profits were being made.

'The question of proprietaries is the one that interests the public most,' he went on. 'Some information has been given to the House about reductions made by three firms, estimated to save £850,000 a year, and a number of other reductions have been made which are estimated to save some £350,000. But I should add that there has been a general downward tendency in price, and I have no reason to suppose that the investigations that have been carried out are the only, if indeed they are even the main, reason for the reductions.'

There were preparations that were unworthy of being sold under the National Health Service, Mr. Macleod said, 'but we must also remember that this industry has made a wonderful advance in recent years. It has an export trade of very great importance indeed, and research is absolutely vital to it. Also, an infinite amount of research may be necessary before one single product proves worth putting on the market. All these matters are apt to be reflected in the price.'

A Treasury minute published as a White Paper on 21 February stated that investigations would be made to bring down the prices of drugs and medicines. Inquiries will centre on three issues: profits on the manufacture and distribution of unbranded drugs and preparations; costs of manufacture of selected basic drugs; and prices of selected proprietary preparations.

KID Changes

THE Treasury have made an Order under Section 10(5) of the Finance Act, 1926, continuing from 19 February until 18 August the exemption from Key Industry Duty of all the articles exempted from that duty by previous Orders which expired on 19 February, with the addition of:

Coloured neutral glass tubing of the types until now exempt only if uncoloured; N-benzyl - N'N'-dimethyl-N-2-pyridylethylenediamine citrate; N-benzyl-N'N'-dimethyl-N-2-pyridylethylenediamine hydrochloride; *o*-chlorobenzoic acid; *p*-cresol; and toluene-*p*-sulphondichloroamide.

And with the deletion of: gadolinium oxide; *p*-*tert*butylphenol; *p*-chlorotoluene; di-*n*-butylamine; di(monomethylcyclohexyl)-*o*-phthalate; ethyl monocyanoacetate; 2-*n*-butoxyethyl 4-chloro-2-methylphenoxyacetate; 2-*n*-butoxyethyl 2:4-dichlorophenoxyacetate; 2-*n*-butoxyethyl 2:4:5-trichlorphenoxyacetate; β-2:4-dichlorophenoxyethyl sodium sulphate; histamine dihydrochloride; monomethylcyclohexanol; tetrasodium pyrophosphate; and pentasodium triphosphate.

• HOME •

Glass Across the World

In 10 weeks, nearly 30 Oldershaw fractionating columns have left the Wearside works of James A. Jobling & Co. Ltd. bound for the laboratories of the world's greatest oil-producing companies. Their packing is as much a work of art as their manufacture is one of science: wrapped in wool, each column travels in a wooden container, which in turn is suspended between eight strong steel springs mounted in the 8-ft. travelling crate. Thus cushioned, every fragile tube has reached its destination safe and undamaged.

Sigmund Pumps at Leipzig

Sigmund Pumps Ltd., of Team Valley, Gateshead 11, are among the British exhibitors at the Leipzig Spring Fair (27 February to 9 March). Their display is limited by space to only a few typical examp'es from their range of modern centrifugal pumping plant but includes pumps designed for the oil refining and chemical industries. Units in the Sigmund process pump range are available to operate at temperatures up to 510° C and for pressures up to 1,500 psi.

'Remove Duty Limit' Plea

The National Union of Manufacturers has approached the President of the Board of Trade on the question of removing the limit of £2,000, above which import of plant and machinery is free of duty. The NUM maintains that the fact that plant and machinery costing less than £2,000 is subject to duty imposes a serious hardship on the small manufacturer and 'apparently is levied to suit the administrative convenience of the Government.' The Union estimates that 60 per cent of import licences issued in 1951 were for less than £2,000.

Area Office Moves

Birlec Ltd. announce new addresses for their London area and Newcastle-on-Tyne offices. The new offices are at Ediswan House, 155/161 Charing Cross Road, London W.C.1 (Tel.: GERrard 8660) and c/o The British Thomson Houston Co. Ltd., 9 Higham Place, Newcastle-on-Tyne 1 (Tel.: Newcastle 25040). Mr. S. G. King is the manager of the London area and Mr. J. W. Payne resident sales and service engineer in Newcastle.

Geigy Pharmaceutical Co. Ltd.

The name of Pharmaceutical Laboratories Geigy Ltd. has been changed to Geigy Pharmaceutical Co. Ltd., as from 8 February. The firm states that the change is solely for administrative purposes. Business policy will remain unchanged, and there will be no change in the internal and representative staffs.

Pharmacy Lectures

Two special lectures on 'Curare Alkaloids' are to be given by Dr. P. Karrer, Professor of Chemistry, Zürich University, on 10 and 11 March at the Senate House, University of London, at 5.30 p.m. Professor W. H. Linnell, Professor of Pharmaceutical Chemistry at London University, will take the chair at the first lecture.

Summer Tour to Denmark

The Summer Tour of the Food and Agriculture Groups of the Society of Chemical Industry will take place this year in Denmark and will include visits to places of industrial, scientific and general interest in and around Copenhagen. It is intended to leave London on Friday afternoon, 3 June, and arrive back in London on Sunday afternoon, 11 June. The cost will be about £50, based on rail and sea travel.

Ring-oven Technique

On page 472 of our last week's issue we published a letter from Dr. William I. Stephen, of the Services Electronics Research Laboratory Extension, Admiralty, concerning the Weisz ring-oven and ring-oven technique. In this letter Dr. Stephen said: 'I should like to recommend it (the technique) to all your readers who are interested in qualitative and semi-quantitative analysis of small amounts of inorganic material.' Unfortunately, in the printing of this letter 'semi-qualitative' appeared instead of 'semi-quantitative' and 'organic' rather than 'inorganic.'

Postmark for Pharmaceutical Assembly

A special commemorative postmark has been authorised for the 16th General Assembly of the International Pharmaceutical Federation, which is being organised by the Pharmaceutical Society of Great Britain and will be held in London from 19 to 23 September.

OVERSEAS

6,000,000 Tons of Steel for India

Indian Minister for Production, Mr. K. C. Reddy, told pressmen in Bangalore recently that plans have been nearly settled for producing 6,000,000 tons of steel by the end of the second Five-Year Plan.

Bowater Mill Increases Output

The Bowater Paper Corporation paper mill at Calhoun, Tennessee, USA, is now producing at a rate of about 140,000 tons of newsprint and 70,000 tons of sulphate pulp a year. The mill was originally planned for a capacity of 130,000 tons of newsprint and 55,000 tons of pulp, but the output rate is being steadily increased.

IG Farben Deconcentration

In a recent written Parliamentary reply Mr. R. H. Turton, Joint Under-Secretary of State for Foreign Affairs, said that Allied High Commission Law No. 84 did not oblige the Federal German Republic to maintain the pattern of ownership established by the IG Farben deconcentration programme. It was only designed to secure the completion of the programme through German agencies and German law.

Dalic Metachemical

Dalic Metachemical, a newly-formed associate of Metachemical Processes of London and Laboratories Dalic of Paris, has bought a works and laboratory in Toronto. The firm will develop and distribute specialised electro-plating equipment for the anti-corrosive treatment of pipe for use in oil and synthetic fuel pipelines.

C-I-L Export Outlook is Brighter

Speaking in Toronto, Dr. Alexander Fleck, I.C.I. chairman, said the overseas trade outlook for Canadian Industries (1954) Ltd. had recently considerably improved. Substantial shipments of dynamite and polyethylene had gone to several overseas countries and there were good prospects for development in other products. The company, he said, stood to benefit considerably from the highly-developed world marketing organisation maintained by the parent company.

British Celanese in New Zealand

British Celanese Ltd. has bought factory premises at Epsom, Auckland, New Zealand, together with knitting, dyeing and finishing plant. When the plant has been modified, warpknit fabrics and, later, as supplies become available, fabrics from nylon yarn and the company's Tricel triacetate yarn will be produced.

New Canadian Sodium Silicates Plant

National Silicates Ltd. plans early construction of a new plant at Valleyfield, Que., for production of sodium silicates. Bulk of the output will go to serve the adjacent $6,000,000 chemical plant soon to be constructed for the first Canadian production of synthetic fluid cracking catalysts for use by the oil refining industry.

Canadian Terylene

First substantial deliveries of Canadian Terylene have left the Millhaven, Ontario, plant, it is announced by Canadian Industries (1954) Ltd. Full production is expected to start this summer at the plant, which will have a capacity of 11,000,000 lb. a year (see THE CHEMICAL AGE, 1954, 71, 762).

UNKRA to Build Cement Plant

The United Nations Korean Reconstruction Agency (UNKRA) recently signed an agreement with the Republic of Korea's Ministry of Commerce and Industry for construction of a $5,000,000 cement plant capable of producing 100,000 metric tons of cement annually. The plant, the largest single project in UNKRA's programme of aid to the republic, will be built at Mungyong, in Kyongsang Pukto Province, near the peninsula's east coast. UNKRA already has begun rehabilitating the Samchok Cement Plant in Kangwon Province.

Vulcanising by Atomic Energy

The United States Air Force's Research and Development Command has announced a new process using atomic energy to vulcanise both natural and synthetic rubber. The process, using gamma radiation in place of conventional chemical and heat treating vulcanising methods, was discovered after unsuccessful attempts by researchers to vulcanise an experimental type rubber.

PERSONAL

Among those recently elected Fellows of the Royal Society of Arts were MR. GUY CHIPPERFIELD, chairman of British Oil & Cake Mills Ltd., and SIR GEOFFREY HEYWORTH, chairman of Unilever Ltd.

APV-Paramount Ltd., non-ferrous, stainless and special steel founders, of Crawley, announce the appointment as chief methods engineer of MR. D. COLBRIDGE. Mr. Colbridge, who was a member of the Steel Founding Productivity Team that visited the USA in 1949, was previously chief methods engineer to the David Brown Foundries Company.

DR. H. G. TAYLOR, D.Sc., M.I.E.E., F.Inst.P., Director of Research of the British Welding Research Association since 1947, has been elected President of the Society of Engineers. He has been associated with the Society since 1947 and has been a member of its council for seven years.

PROFESSOR E. R. H. JONES, Ph.D., D.Sc., F.R.I.C., F.R.S., Sir Samuel Hall Professor of Chemistry at Manchester University, has been elected to the Waynflete Professorship of Chemistry at Oxford University with effect from 1 August, 1955. The present Waynflete Professor of Chemistry, SIR ROBERT ROBINSON, O.M., M.A., D.Sc., LL.D., F.R.I.C., F.R.S., was installed as president of the British Association for the Advancement of Science in January.

Monsanto Chemicals Ltd. announce the appointment of DR. H. R. NEWMAN, M.B., Ch.B., medical officer at their Newport factory, as principal medical officer of the company.

GENERAL SIR KENNETH N. CRAWFORD, K.C.B., M.C., has been elected to the board of directors of Cyanamid Products Ltd., the London subsidiary of the American Cyanamid Company of New York. General Crawford is a Royal Engineer Officer, who served in both World Wars and held a variety of Engineer and Staff appointments during his Army service. During the war his appointments included, among others, Director of Chemical Warfare (in 1940-41), and Director of Air (Land/Air Warfare) from 1942 to the end of the war, in which capacity he organised the British Airborne Forces. After the war, he commanded the British Troops in Greece for a year and was then appointed Deputy Chief of the Imperial General Staff at the War Office, where he served as a member of the Army Council from 1947 to 1949. From October 1949 until his retirement from the Army in October 1953, he was Controller of Munitions at the Ministry of Supply and Chairman of the Royal Ordnance Factories Board of Management. In 1954 he carried out an extensive lecture tour of Canada and the US on behalf of the British Information Services. He is 59 years of age.

SIR WILLIAM FRASER, Kt., C.B.E., LL.D., Officer of the Legion of Honour, chairman of the British Petroleum Co. Ltd., who was created a Baron in the New Year Honours List, has chosen the title of Baron Strathalmond, of Pumpherston in the County of Midlothian.

The Institution of Mechanical Engineers has awarded the James Clayton Prize for 1954 to SIR CHRISTOPHER HINTON, Kt., M.A., M.I.C.E., M.I.Mech.E., for his pioneer work in applying the results of nuclear research to the production of fissile material and industrial power.

The Bradford Dyers' Association Ltd. have announced the retirement of three members of the board, MR. HAROLD HENRY BOWEN, MR. ARNOLD HIGHLEY and MR. FRANK HOPKINSON, all of whom have previously relinquished their executive duties.

MR. GORDON C. INSKEEP, who for the past two years has been European representative, American Chemical Society publications, at Bush House, London, is to return to the USA with his wife and two children on 27 February. He is taking up an appointment as an associate editor in the society's New York office. Succeeding him is MR. WILLIAM Q. HULL, formerly of the San Fransisco office, who arrived in this country last week.

At the annual general meeting of the Microchemistry Group of the Society for Analytical Chemistry on 28 January, the following officers were elected for the ensuing

year: *chairman*, DR. G. F. HODSMAN, B.Sc., Ph.D., A.Inst.P.; *vice-chairman*, MR. D. F. PHILLIPS, A.R.I.C.; *hon. secretary*, MR. D. W. WILSON, M.Sc., F.R.I.C. (Sir John Cass College, Jewry Street, London E.C.3); *hon. treasurer*, MR. G. INGRAM, A.R.I.C. (Research Laboratories, Courtaulds Ltd., Lower Cookham Road, Maidenhead, Berks).

The annual general meeting of the North of England Section was held on 29 January, when officers elected were: *chairman*, MR. J. R. WALMSLEY, A.M.C.T., F.R.I.C., Ph.C.; *vice-chairman*, MR. A. N. LEATHER, B.Sc., F.R.I.C.; *hon. secretary and treasurer*, MR. A. ALCOCK, A.M.C.T., F.R.I.C. (City Laboratory, 143 Regent Road, Salford 5, Lancs).

Obituary

SIR CHARLES MARTIN, C.M.G., M.B., D.Sc., F.R.C.P., F.R.S., director of the Lister Institute from 1903 to 1930, died on 15 February at his home near Cambridge, aged 89. After studying at King's College, London, St. Thomas's Hospital and Leipzig, he qualified as M.R.C.S., L.S.A., in 1889 and obtained the M.B. Lond. in 1890. Before going to the Lister he was professor of physiology at Melbourne; he was appointed to the Chair of Experimental Pathology at London in 1912; and after retiring from his post at the Lister he was professor of biochemistry and general physiology at Adelaide from 1931 to 1933, as well as chief of the division of animal nutrition of the Australian Council for Scientific and Industrial Research. He was elected F.R.S. in 1901 and received the Royal Society Royal Medal in 1923. He was knighted in 1927 and was awarded honorary degrees by the universities of Cambridge, Dublin, Durham, Edinburgh, Melbourne and Sheffield; he was a Fellow of King's College.

The death occurred on 7 February of MR. DAVID A. BREMNER, O.B.E., M.I.Chem.E., M.I.E.E., who was Director of the British Engineers' Association from 1919 to 1943. During his tenure of office Mr. Bremner became closely connected with many industrial organisations. He was a member of the Grand Council of the Federation of British Industries and served on 34 FBI committees, being chairman of five of them. In 1928 he was elected to the Standardisation and Simplification Committee of the Board of Trade and the following year to the Mechanical Industry Committee of the British Engineering Standards Association; he continued his work in the field of standardisation when the latter body became the British Standards Institution. Mr. Bremner was a member of the Council of the Institution of Mining and Metallurgy. He received the O.B.E. for his services as head of the Aluminium Section of the Ministry of Munitions during the first war.

Photometric Methods Analysis

continued from page 534

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Art & Photographic Competition

In connection with the annual conference of the Institute of Metal Finishing, to be held in Torquay from 17 to 21 May, an art and photographic competition is being arranged, open to all members of the institute and those attending the conference, including ladies.

Publications & Announcements

MANY of the X-ray and electron diffraction powder patterns of the crystalline structures of standard materials have been classified. The American Society for Testing Materials, for example, has established such a classification. Normally, crystalline phases of metals and alloys, chemicals, and other materials may be identified by comparison with standard patterns such as those available in the ASTM Index. Unfortunately, patterns of many compounds have not been recorded. Data on the crystal system and unit cell constants of many of the unrecorded compounds, however, are available. Charts specifically designed for determining the interplanar spacing of tetragonal, hexagonal, and orthorhombic crystals from data on crystal systems and unit cell constants have been prepared by J. C. Bell and A. E. Austin, of Battelle Institute, Columbus (Ohio). The 'Battelle Indexing Charts for Diffraction Patterns of Tetragonal, Hexagonal, and Orthorhombic Crystals,' which were originally conceived by R. A. Harrington, provide a simple and convenient nomographic method for making such determinations. Copies of these charts may be obtained by writing to the Battelle Publications Office, 505 King Avenue, Colombus 1, Ohio, USA.

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A BOOKLET issued by the British Iron and Steel Research Association, *The Prevention of Corrosion*, sets out briefly the results of prolonged investigations into the subject. In dealing with structural steels, the importance of good basic design is stressed; it minimises the chances for moisture and atmospheric grime to lodge and helps to encourage efficient maintenance. From the point of view of cost, low-alloy steels are said to offer the best inherent qualities for general use as structural materials. In protective painting of steel the important factors are thorough surface preparation, the use of a suitable inhibitive priming paint and adequate thickness of the complete painting scheme with finishing coat. The booklet deals with corrosion in water from two aspects—ship structure and shore installations—and corrosion in soil. It is obtainable (price 2s.) from BISRA, 11 Park Lane, London W.1.

THE proceedings of the National Smoke Abatement Society's conference at Scarborough last September have now been published in the form of a booklet which is obtainable from the society's offices, 30 Grosvenor Place, London S.W.1, price 7s. 6d. The reports include a Des Voeux lecture by Sir Edward Salisbury, Director of the Royal Botanic Gardens, Kew, on air pollution and plant life, an address by Sir Hugh Beaver and a presidential address on the fuel situation by Sir Ernest Smith. There are also illustrated papers on the problem of railway smoke and the industrial uses of gas and electricity. Discussions on the papers are included.

* * *

THREE provisional data sheets and seven technical leaflets have been prepared by John & E. Sturge Ltd., 1 Wheeleys Road, Birmingham 15, describing the physical properties and chemical analysis of their various grades of precipitated calcium carbonate (PCC). Copies, contained in a folder, are obtainable from the firm, who intend to publish technical leaflets on other chemicals from time to time.

* * *

AN oil well bore caliper that can be passed through two-inch tubing, then opened like an umbrella to measure bore holes up to 36 in. in diameter, is one of two new instruments developed at the Bureau of Mines Petroleum Experiment Station in Bartlesville, Okla. The other instrument is a new type of liquid-level gauge, also operable through two-inch tubing, which can be used to determine directly and accurately the height of a static column of liquid in a well or to follow a moving liquid level accurately to within ½ in. The instruments, which resulted from work done at Bartlesville under a co-operative agreement with the State of Oklahoma, have been tested successfully in co-operation with several oil companies. Both instruments, were designed principally for use in secondary-recovery operations, where water or gas is pumped underground to force oil to producing wells. They also can be used in primary oil production. The bore caliper has already been used successfully by the Federal Geological Survey to measure diamond-drill holes at uranium prospects.

British Chemical Prices

(These prices are checked with the manufacturers, but it must be pointed out that in many cases there are variations according to quantity, quality, place of delivery, etc.)

LONDON.—A good movement of supplies against contracts and a steady flow of new business on home account describe most sections of the industrial chemicals market during the past week. There has also been fairly active inquiry for shipment. There have been no outstanding price movements and the undertone remains firm. In the coal tar products market the position is strong with carbolic acid, phenol crystals and creosote oil finding a ready outlet.

MANCHESTER.—With an odd exception prices on the Manchester market for heavy chemical products have been maintained on a steady to firm basis, with few actual changes of any consequence to report during the past week. Delivery specifications covering a wide range of textile chemicals have covered a fairly substantial quantity in the aggregate and other leading industrial consumers are calling for steady supplies. A fair amount of new business has been placed during the past few days. A gradual improvement in the demand for fertilisers, including superphosphates and sulphate of ammonia, is reported, and a ready outlet is being found for most of the tar products.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 10 tons, £83 ; 80% pure, 10 tons, £89 ; commercial glacial, 10 tons, £91 ; delivered buyers' premises in returnable barrels (technical acid barrels free) ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £123 per ton.

Alum.—Ground, about £23 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s. per ton d/d. MANCHESTER : £14 10s. to £17 15s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2-cwt. non-returnable drums : 1-ton lots, £49 per ton.

Ammonium Chloride.—Per ton lot, in non-returnable packaging, £27 17s. 6d.

Ammonium Nitrate.—D/d, £31 per ton (in 4-ton lots).

Ammonium Persulphate. — MANCHESTER : £6 5s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £97 and £94 10s. per ton.

Antimony Sulphide.—Crimson, 4s. 4d. to 4s. 9½d. ; golden, 2s. 7½d. to 4s. 0¾d. ; all per lb., delivered UK in minimum 1-ton lots.

Arsenic.—Per ton, £45 to £50 ex store.

Barium Carbonate.—Precip., d/d : 4-ton lots, £39 per ton ; 2-ton lots, £39 10s. per ton, bag packing.

Barium Chloride.—£42 15s. per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £42 10s. per ton d/d ; 2-ton lots, £43 per ton d/d.

Bleaching Powder.—£27 17s. 6d. per ton in returnable casks, carriage paid station, in 4-ton lots.

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid : Anhydrous, £58 10s. ; in 1-cwt. bags ; commercial, granular, £38 10s. ; crystal, £41 ; powder, £42 ; extra fine powder, £43 ; BP, granular, £47 10s. ; crystal, £50 ; powder, £51 ; extra fine powder, £52.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid : Commercial, granular, £67 ; crystal, £75 ; powder, £72 10s. ; extra fine powder, £74 10s. ; BP, granular, £80 ; crystal, £84 10s. ; powder, £87 ; extra fine powder, £86 10s.

Calcium Chloride.—Per ton lot, in non-returnable packaging : solid, £15 ; flake, £16.

Chlorine, Liquid.—£36 7s. 6d. per ton, in returnable 16-17-cwt. drums, delivered address in 3-drum lots.

Chromic Acid.—2s. 0⅝d. per lb., less 2½%, d/d UK, in 1-ton lots.

Chromium Sulphate, Basic.—Crystals, 7½d. per lb. delivered (£70 per ton).

Citric Acid.—1-cwt. lots, £10 5s. cwt. ; 5-cwt. lots, £10 cwt.

Cobalt Oxide.—Black, delivered, bulk quantities, 13s. 2d. per lb.

Copper Carbonate.—2s. 6d. per lb.

Copper Sulphate.—£96 10s. per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £9 12s.

Formaldehyde.—£37 5s. per ton in casks, d/d.

Formic Acid.—85%, £86 10s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £13 3s. 6d. to £13 14s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 17s. 7d. per lb., in 28-lb. lots.

Iodoform.—£1 6s. 7d. per lb., in 28-lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton ; dark tech., 44 per cent by weight £73 per ton ex-works ; dark chemical quality, 44 per cent by weight, £109 per ton, ex-works ; 1-ton lots, usual container terms.

Lead Acetate.—White : About £147 to £149 per ton.

Lead Nitrate.—About £128, 1-ton lots.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £132 5s. ; orange lead, £144 5s. Ground in oil : red, £150 ; orange, £162.

Lead, White.—Basis prices : Dry English in 5-cwt. casks, £137 10s. per ton. Ground in oil : English, 1-cwt. lots, 178s. per cwt.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton ; grey, 80-82%, ton lots. d/d, £45 per ton.

Litharge.—£134 5s. per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, about £28 per ton.

Magnesium Carbonate.—Light, commercial, d/d, 2-ton lots, £84 10s. per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex-wharf), £16 per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—Crystals, £15 per ton.

Mercuric Chloride.—Technical Powder, £1 8s. 9d. per lb., in 5-cwt. lots ; smaller quantities dearer.

Mercury Sulphide, Red.—£1 11s. 3d. per lb., for 5-cwt. lots.

Nickel Sulphate.—D/d, buyers U.K. £170 per ton. Nominal.

Nitric Acid.—80 Tw., £35 per ton.

Oxalic Acid.—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, about £131 per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £92 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £93 10s. per ton for 1-ton lots ; Liquid, £36 5s.

Potassium Carbonate. — Calcined, 96/98%, about £63 per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, 1-ton lots, about £22 per ton.

Potassium Dichromate.—Crystals and granular, 11⅞d. per lb., in 1-ton lots, d/d UK.

Potassium Iodide. B.P., 14s. 1d. per lb. in 28-lb. lots ; 13s. 7d. in cwt. lots.

Potassium Nitrate.—In 4-ton lots, in non-returnable packaging, paid address, £63 10s. per ton.

Potassium Permanganate.—B.P., 1-cwt. lots, 1s. 8½d. per lb. ; 3-cwt. lots, 1s. 8d. per lb. ; 5-cwt. lots, 1s 7½d. per lb. ; 1-ton lots, 1s. 7d. per lb. ; 5-ton lots, 1s. 6½d. per lb. ; Tech., 5-cwt. packed in 1-cwt. drums, £8 12s. 6d. per cwt. ; packed in 1 drum, £8 11s. 6d. per cwt. ; 1-ton packed in 5-cwt. drums, £8 7s.

Salammoniac.—Per ton lot, in non-returnable packaging, £45 10s.

Salicylic Acid. — MANCHESTER : Technical 2s. 7½d. per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £15 5s. 6d. per ton, 1-ton lots.

Soda, Caustic.—Solid 76/77% ; spot, £26 to £28 per ton d/d. (4 ton lots).

Sodium Acetate.—Commercial crystals, £80 to £85 per ton d/d.

Sodium Bicarbonate.—Per ton lot, in non-returnable packaging, £15 10s.

Sodium Bisulphite.—Powder, 60/62%, £40 to £42 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—Per ton lot, in non-returnable packaging, paid address, £59 5s.

Sodium Chlorate.—£75 per ton in free 1-cwt. drums, carriage paid station, in 4-ton lots.

Sodium Cyanide.—96-98%, £113 5s. per ton lot in 1-cwt. drums.

Sodium Dichromate.—Crystals, cake and powder, 10d. lb. Net d/d UK, minimum 1-ton lots ; anhydrous, 11½d. lb. Net del. d/d UK, minimum 1-ton lots.

Sodium Fluoride.—Delivered, 1-ton lots and over, £4 10s. per cwt. ; 1-cwt. lots, £5 per cwt.

Sodium Hyposulphite.—Pea crystals £34 a ton ; commercial, 1-ton lots, £30 15s. per ton, carriage paid.

Sodium Iodide.—BP, 17s. 1d. per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £127 per ton.

Sodium Metasilicate.—£22 15s. per ton, d/d UK in ton lots.

Sodium Nitrate.—Chilean Industrial, over 98% 6-ton lots, d/d station, £27 10s.

Sodium Nitrite.—£32 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 2s. 10½d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £37 10s., anhydrous, £81 ; tri-sodium, crystalline, £39 10s., anhydrous, £79.

Sodium Silicate.—75-84 TW. Zoned. Drums delivered station. Lancashire and Cheshire, 4-ton lots, carriage paid station, £15 per ton ; Dorset, Somerset and Devon, £3 17s. 6d. per ton extra ; Scotland and S. Wales, £3 per ton extra. Elsewhere in England, excluding Cornwall and Wales, £2 17s. 6d. per ton extra.

Sodium Sulphate (Glauber's Salt).—About £8 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £32 2s. 6d. per ton, d/d, in drums ; broken, £33 2s. 6d. per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £59 per ton ; pea crystals, £37 12s. 6d. per ton d/d station in kegs ; commercial, £23 7s. 6d. per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £20 to £22, according to fineness.

Sulphuric Acid.—Net, naked at works, 168° Tw. according to quality, per ton, £10 7s. 6d. to £11 10s. ; 140° Tw., arsenic free, per ton, £8 5s. ; 140° Tw., arsenious, per ton, £7 17s.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £12 10s.

Titanium Oxide.—Standard grade comm., with rutile structure, £155 per ton ; standard grade comm., £135 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d, white seal, £102 ; green seal, £100 ; red seal, 2-ton lots, £103 per ton.

Solvents & Plasticisers

Acetone.—Small lots: In 5-gal. cans : 5-gal., £125 10-gal. and upward, £115, cans included. In 40/45 gal. returnable drums, spot : Less than 1 ton, £90 ; 1 to less than 5 tons, £87 ; 5 to less than 10 tons, £86 ; 10 tons and upward, £85. In tank wagons, spot : 1 to less than 5 tons (min. 400 gal.), £85 ; 5 to less than 10 tons (1,500 gal.), £84 ; 10 tons and upward (2,500 gal.), £83 ; contract rebate, £2. All per ton d/d.

Butyl Acetate BSS.—£169 per ton, in 1-ton lots ; £167 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £154 per ton d/d.

***sec.*-Butyl Alcohol.**—5 gal. drums £159 ; 40 gal. drums : less than 1 ton £124 per ton ; 1 to 10 tons £123 per ton ; 10 tons and over £122 per ton ; 100 tons and over £120 per ton.

***tert.*-Butyl Alcohol.**—5 gal. drums £195 10s. per ton ; 40/45 gal. drums : less than 1 ton £175 10s. per ton ; 1 to 5 tons £174 10s. per ton ; 5 to 10 tons, £173 10s. ; 10 tons and over £172 10s.

Diacetone Alcohol.—Small lots : 5 gal. drums, £177 per ton ; 10 gal. drums, £167 per ton. In 40/45 gal. drums ; less than 1 ton, £142 per ton ; 1 to 9 tons, £141 per ton ; 10 to 50 tons, £140 per ton ; 50 to 100 tons, £139 per ton ; 100 tons and over, £138 per ton.

Dibutyl Phthalate.—In drums, 10 tons, 2s. per lb. d/d ; 45 gal. drums, 2s. ¾d. per lb. d/d.

Diethyl Phthalate.—In drums, 10 tons, 1s. 10¼d. per lb. d/d ; 45 gal. drums, 1s. 11¾d. per lb. d/d.

Dimethyl Phthalate.—In drums, 10 tons, 1s. 7¼d. per lb. d/d ; 45 gal. drums, 1s. 8¾d. per lb. d/d.

Dioctyl Phthalate.—In drums, 10 tons, 2s. 8d. per lb. d/d ; 45 gal. drums, 2s. 9½d. per lb. d/d.

Ether BSS.—In 1 ton lots, 1s. 11d. per lb ; drums extra.

Ethyl Acetate.—10 tons lots, d/d, £133 per ton.

Ethyl Alcohol (PBS 66 o.p.).—Over 300,000 p. gal., 2s. 9d. ; 2,500-10,000 p. gal., 2s. 11½d. per p. gal., d/d in tankers. D/d in 40/45-gal. drums, 1d. p.p.g. extra. Absolute alcohol (75.2 o.p.) 5d. p.p.g. extra.

Methanol.—Pure synthetic, d/d, £43 15s. per ton.

Methylated Spirit.—Industrial 66° o.p. : 500 gal. and over in tankers, 4s. 10d. per gal. d/d ; 100-499 gal. in drums, 5s. 2½d. per gal. d/d. Pyridinised 64 o.p. : 500 gal. and over in tankers, 5s. 0d. per gal. d/d ; 100-499 gal. in drums, 5s. 4½d. per gal. d/d.

Methyl Ethyl Ketone.—10-ton lots, £141 per ton d/d.

Methyl *iso*Butyl Ketone.—10 tons and over £162 per ton.

***iso*Propyl Acetate.**—In drums, 10 tons, £128 per ton d/d ; 45 gal. drums, £133 per ton d/d.

***iso*Propyl Alcohol.**—Small lots : 5 gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton ; 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s. per ton ; 50 tons and over. £80 per ton.

Rubber Chemicals

Carbon Bisulphide.—£61 to £67 per ton, according to quality.

Carbon Black.—8d. to 1s. per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £76 10s. per ton.

India-rubber Substitutes.—White, 1s. 6¾d. to 1s. 10½d. per lb. ; dark, 1s. 4½d. to 1s. 8d. per lb.

Lithopone.—30%, about £54 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Sulphur Chloride.—British, about £50 per ton.

Vegetable Lamp Black.—£64 8s. per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton, in 6-ton lots, d/d farmers' nearest station ; March to June, £18.

Compound Fertilisers.—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1. January to June, £25 14s.

'Nitro-Chalk.'—£15 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots, d/d nearest station : February, £26 5s. ; March to June, £26 10s.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals. delivered in bulk, 90's, 5s. ; pure, 5s. 4d.

Carbolic Acid.—Crystals, 1s. 4d. to 1s. 6½d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 4½d. to 1s. 6½d. per lb., d/d crude, 8s. naked, at works.

Creosote.—Home trade, 1s. to 1s. 4d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

Cresylic Acid.—Pale 99/99½%, 5s. 9d. per gal. ; 99.5/100%, 6s. per gal. D/d UK in bulk ; Pale A.D.F., from 5s. 6d. per Imperial gallon, f.o.b.

Naphtha.—Solvent, 90/160°, 5s. per gal. for 1000-gal. lots ; heavy, 90/190°, 4s. per gal. for 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

Naphthalene.—Crude, 4-ton lots, in sellers' bags, £16 6s. to £24 2s. per ton nominal, according to m.p. ; hot pressed, £40 per ton in bulk ex-works ; purfied crystals, £58 per ton d/d.

Pitch.—Medium, soft, home trade, £8 10s. per ton f.o.r. suppliers' works ; export trade about £10 10s. per ton f.o.b. suppliers' port.

Pyridine.—90/160°, £1 7s. 6d. to £2 per gal.

Toluole.—Pure, 5s. 7d. ; 90's, 4s. 10d. per gal. d/d. MANCHESTER : Pure, 5s. 7d. per gal. naked.

Xylole.—For 1000-gal. lots, 5s. 10d. to 6s. per gal., according to grade, d/d London area.

Intermediates & Dyes
(Prices Nominal)

***m*-Cresol 98/100%.**—4s. 3d. per lb. d/d.

***o*-Cresol 30/31° C.**—1s. 4d. per lb. d/d.

***p*-Cresol 34/35° C.**—4s. 3d. per lb. d/d.

Dichloraniline.—3s. 6d. per lb.

Dinitrobenzene.—88/89°C., 1s. 11d. per lb.

Dinitrotoluene.—S.P. 15° C., 1s. 11½d. per lb. ; S.P. 26° C., 1s. 3d. per lb. S.P. 33°C., 1s. 1½d. per lb. ; S.P. 66/68°C., 1s. 9d. per lb.

***p*-Nitraniline.**—4s. 7d. per lb.

Nitrobenzene.—Spot, 9½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

***o*-Toluidine.**—1s. 9d. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s. 6d. per lb., in casks.

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Chemical & Allied Stocks & Shares

THE boom in stock markets that started a year ago and has since put many industrial shares up to record levels has been checked by a big wave of selling in which share values showed a widespread decline. This is the first time for some 12 months that persistent selling has been encountered. The raising of the bank rate from 3 per cent to 3½ per cent last month came as a general surprise to investors. Mr. Butler's warning about the need to export more and of signs of inflation problems have indicated that a further bank rate rise is a probability. Normally sterling is strong at this period of the year, but has weakened in recent weeks. It is assumed that it may be strengthened by a higher bank rate. Another reason for the present uncertainty is the fact that optimism regarding the coming Budget has now given way to pessimistic views.

Followed General Trend

Shares of chemical and kindred companies have naturally moved back with the general trend of markets, despite the expectation that financial results for the past year will show a general increase in earnings. In fact, hopes of higher dividends persist, but with markets in their present uncertain state it must be expected that for the present chemical shares will continue to move with the prevailing trend.

Compared with a month ago, Imperial Chemical moved back from 45s. to 40s. 1½d. despite continued hopes that the dividend on the doubled ordinary capital may be 10 per cent. Fisons have declined on balance from 59s. to 55s. 9d. and, despite bigger dividend hopes. Albright & Wilson 5s. shares were down on balance from 31s. 6d. to 27s. After reaching the record level of 18s. 4½d., Reichhold Chemical 5s. shares came back to 15s. 4½d.

Monsanto 5s. shares have receded from 33s. 9d. to 32s. with the prevailing trend in stock markets. British Chrome & Chemicals 5s. shares were down on balance for the month from 14s. to 12s. 9d. and Laporte 5s. shares from 17s. 9d. to 16s. 9d. Coalite & Chemical 2s. shares have not held best levels, but at 4s. 4½d. moved slightly higher on balance. In other directions, British Glues 4s. shares fell from 14s. to 12s., Hickson Welch 10s. shares from 20s. 6d. to 18s. 6d. 'ex rights,' and Lawes Chemical from 15s. 10½d. a month ago to 15s., but Brotherton were among exceptions to the general trend, showing a rise on balance for the month from 31s. 3d. to 31s. 9d.

Wiliam Blythe 3s. shares have remained at 18s. 6d. at the time of writing and Boake Roberts 5s. shares at 14s. 4½d. At 8s. 3d. the 5s. shares of British Tar Products were only 3d. easier on balance. At the time of writing, Burt Boulton & Haywood at 32s. 6d. have remained under the influence of the higher interim dividend; a month ago they were 31s. 3d. Greeff-Chemicals Holdings 5s. shares at 15s. 7½d. show a rise of 1s. 6d., but the quotation was not tested by many dealings. There has been a large business in Borax Consolidated and there was general satisfaction that the American group who had been planning to make an offer for control decided not to continue with the plan. Raising of the Borax Consolidated dividend from 11 per cent to 18 per cent was in accordance with general expectation, but owing to the set-back in stock markets, the shares have declined on the month from 101s. 3d. to 98s. 3d. Yorkshire Dyeware 5s. shares at 11s. 9d. were 1s. higher than a month ago. Shares of plastics companies were higher in a few cases. Bakelite, for instance, were 31s., as against 28s. 9d., but British Xylonite fell back from 43s. 9d. to 40s. British Industrial Plastics 2s. shares receded from 6s. to 5s. 4½d. In other directions, British Oxygen declined from 68s. 9d. to 64s. 3d. Boots Drug 5s. shares, which were 32s. a month ago, have come back to 26s. 1½d. Unilever were 72s. 6d., compared with 79s. 3d. Oils, too, reflected the prevailing trend in stock markets.

Chemicals for China

Chemicals, textiles and scientific instruments are among goods being sold to China under contracts estimated to be worth nearly £4,000,000. Mr. J. A. Blott, leader of the private British trading mission in Peking that is negotiating the orders, said recently that his group had already signed more than 130 contracts.

Heavy Water Company

THE United Kingdom Atomic Energy Authority and the New Zealand Government will be the sole shareholders in a new company, Geothermal Development, which will produce heavy water and electric power from geo-thermal steam bores in New Zealand. It is envisaged that production of heavy water will begin late in 1957 and of electric power a few months later.

Announcement of the formation of the company was made on 21 February. It will have a nominal capital of £30,000 and the remainder of the capital requirements will be provided by loans. Those for the £2,000,000 heavy water plant will come from the Authority and those for the £4,000,000 electric power equipment from the New Zealand Government.

The first directors are: Britain, Sir Donald Perrott, a member of the Authority, and Mr. A. S. White, head of the Chemical Engineering Division at Harwell; New Zealand, Mr. B. C. Ashwin, Secretary of the Treasury, Mr. A. D. Davenport, general manager, State Hydro-Electric Department, and Mr. C. W. Turner, Engineer-in-Chief, Ministry of Works. Dr. E. Marsden, a former head of the New Zealand Department of Scientific and Industrial Research, will also be associated with the board.

Diacetylmorphine

CURRENT licences for the general manufacture of diacetylmorphine under the Dangerous Drugs Act, 1951, which expire on 31 December, 1955, will not be renewed, the Home Secretary, Major Gwilym Lloyd-George, stated in a written Parliamentary reply recently. After 31 December licences will only be granted for the manufacture of small quantities required for scientific purposes and the production of nalorphine, for which diacetylmorphine is required as an intermediate stage.

No further exports will be authorised except where the drug is requested by a government for either of the above two uses, and imports will not be permitted.

This decision follows a resolution adopted by the Economic and Social Council of the United Nations at its 18th session urging all governments to prohibit the manufacture, import and export of diacetylmorphine except for such small amounts as are necessary for scientific purposes.

Prices Rose Last Year

COPPER, lead and zinc were among materials that rose considerably in price during 1954, according to figures published in the *Board of Trade Journal*. The percentage rises were 20.6, 15 and 11 respectively. Among the few commodities that fell in price during the year were synthetic resins and plastic materials (down by 1.9 per cent) and paint (2.7 per cent).

'General chemicals' which increased by 3.9 per cent were among manufactured products that showed a rise in price greater than the average of 1.4 per cent. Drugs and pharmaceutical preparations increased by 1 per cent and toilet preparations and perfumery by 0.8 per cent.

Although there was a general rise in prices during the year, basic materials were on an average cheaper at the end of 1954 than at the end of 1952, while prices of manufactured products were at about the same level as they had been two years earlier.

Ramsay Fellowships

THE trustees of the Ramsay Memorial Fellowship Trust will consider in June applications for three Ramsay Memorial Fellowships for advanced students of chemistry. One of the Fellowships will be limited to candidates educated in Glasgow, who can apply to be considered for either Fellowship. The value of each will be £450 per annum to which may be added a grant for expenses of research not exceeding £100 per annum.

The Fellowships will normally be tenable for two years. Full particulars can be obtained from the Joint Honorary Secretaries, Ramsay Memorial Fellowships Trust, University College, London, Gower Street, W.C.1. Completed application forms must be received not later than 21 April.

Record Use of Fertilisers

There was a record consumption of both nitrogenous and phosphatic fertilisers in the UK last year, the Minister of Agriculture (Mr. Heathcoat Amory) said in the House of Commons recently. He was replying to a request that steps should be taken to draw the attention of farmers to the advantages of greater use of fertilisers for all crops.

Next Week's Events

MONDAY 28 FEBRUARY

Chemical Society

Leicester: University College, 5 p.m. 'The Kinetics of Halogenation Reactions' by R. P. Bell.

TUESDAY 1 MARCH

SCI (Plastics & Polymer Group)

London: Chemical Society's Rooms, Burlington House, Piccadilly, 6.30 p.m. 'The Chemistry of the Polymerisation of Caprolactam' by Dr. P. Hermans.

Chemical Society

Dundee: Chemistry Department, Queen's College, 5.15 p.m. 'Liquid Crystals' by Professor Brynmor Jones.

WEDNESDAY 2 MARCH

SCI (Yorkshire Section)

Leeds: Textile Lecture Theatre, The University, 5.30 p.m. 'Investigations on the Chemistry of Caprolactam Polymerisations' by Dr. P. Hermans.

Institution of Chemical Engineers

Leeds: The University, 7 p.m. 'Instrumentation of a Nuclear Power Plant' by P. V. Koller.

Institute of Welding

Manchester: Reynolds Hall, College of Technology, 7.15 p.m. 'Some Welding Problems in the Chemical Industry' by E. J. Heeley.

THURSDAY 3 MARCH

Chemical Society

Bristol: Chemistry Department, The University, 7 p.m. 'The Fuel Scientist: Training and Using Britain's Greatest Asset' by Professor A. L. Roberts (joint meeting with RIC, SCI and Institute of Fuel).

Hull: The University, 6 p.m. 'Some Recent Progress in Natural Product Chemistry' by Professor D. H. R. Barton.

Liverpool: Chemistry Lecture Theatre, The University, 5 p.m. 'The Mode of Action of Pyridoxine' by Dr. H. M. Sinclair (joint meeting with University Chemical Society, RIC, SCI and BAC).

Sheffield: Chemistry Lecture Theatre, The University, 7.30 p.m. 'Structures and Properties of Clathrate Compounds' by H. M. Powell.

Pharmaceutical Society

Manchester: Council Chamber, Houldsworth Hall, 7.45 p.m. Address by Mr. Noble, Secretary of the National Pharmaceutical Union.

Royal Society

London: Burlington House, Piccadilly, 4.30 p.m. 'The Determination of Burning Velocities of Slow Flames' by G. Badami and Sir Alfred Egerton, and 'Studies of the Explosive Combustion of Hydrocarbons by Kinetic Spectroscopy' by R. G. W. Norrish, G. Porter and B. A. Thrush.

FRIDAY 4 MARCH

Society for Analytical Chemistry

London: Royal Society Meeting Room, Burlington House, Piccadilly, 2.45 p.m. Annual general meeting followed by the address of the retiring president, Dr. D. W. Kent-Jones.

Institute of Fuel

Swansea: YMCA, Kingsway, 6 p.m. 'Atomic Energy' by Dr. P. McNair.

Society of Instrument Technology

Fawley: Copthorne House, 7 p.m. 'Mass Spectrometers' by K. J Knowles.

SATURDAY 5 MARCH

Society for Analytical Chemistry

Manchester: Engineers' Club, 2 p.m. 'Some Aspects of Forensic Chemistry' by Dr. G. B. Manning.

IN THE EDITOR'S POST

Corrosion Resistant Cements

SIR,—In your publication dated 4 December, 1954 (THE CHEMICAL AGE, 1954, **71**, 1188) reference was made to a cement manufactured by this company under the trade name of Enolar, stating that this cement was similar to the phenol/furfural cement, details of which were submitted by the Billingham Division of I.C.I. and published in Vol. 32, No. 2, 1954 of the *Transactions of the Institution of Chemical Engineers*.

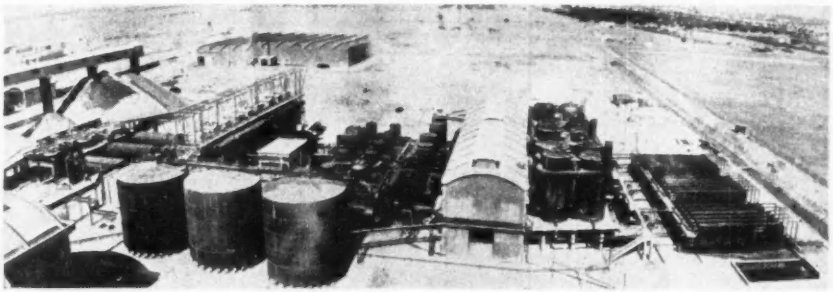
We now wish to correct out statement since Enolar cement is not based on phenol/furfural resin, but is, in fact, a blend of phenolic and furfuryl alcohol resins.

Yours faithfully,

D. P. HULBERT

Director,
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GOLD COAST LOCAL CIVIL SERVICE

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TRAVELLER for Scientific Glass Apparatus, Manchester district. State wages and experience. **BOX No. C.A. 3388, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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Apply in writing to the **DIRECTOR OF RECRUITMENT, COLONIAL OFFICE, GREAT SMITH ST. LONDON, S.W.1,** giving briefly age, qualifications and experience. Mention the reference number BCD 97/60/01.

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, A.E.R.E., HARWELL, BERKS, invites applications from **GRADUATES** for posts in the Reactor Studies Group. The work, covering a broad field, is on studies of advanced types of nuclear reactors for power production and their development problems. Candidates should have a First- or Second-Class Honours Degree in Mechanical or Chemical Engineering, Mathematics or Physics. In the case of senior posts, candidates with Mathematics or Physics degrees should preferably have had some Engineering experience. Successful applicants will be appointed according to age, experience and qualifications, within one of the following grades:—Principal Scientific Officer, £1,205-£1,615 per annum; Senior Scientific Officer, £1,040-£1,205 per annum; Scientific Officer, £505-£905 per annum; and they will be required to join the Authority's Contributory Superannuation Scheme. Rates for women are slightly lower. Applications should be sent to Establishment Officer, United Kingdom Atomic Energy Authority, A.E.R.E., Harwell, Didcot, Berks, quoting 2/103/248.

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THE LIBRARY of a Large Group of Chemical Manufacturing Companies requires a Graduate in Chemistry for information work. Duties will include searching, summarizing, translating and abstracting chemical and patent literature, preparing subject surveys and reports, and obtaining technical information for the Research, Chemical Engineering, and Sales Departments. Ability to translate fluently chemical material from German and at least one other language is essential; knowledge of other languages would be an advantage. The Library is situated 30 miles north of London. Applicants should be under 30 years of age, and be British subjects by birth. **WRITE BOX No. C.A. 937, c o 191, GRESHAM HOUSE, E.C.2.**

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY, ALDERMASTON, BERKS., requires a **SENIOR SCIENTIFIC OFFICER** or **SCIENTIFIC OFFICER** to undertake research in the preparation and fabrication of solid inorganic chemical compounds including work at high temperatures and use of novel techniques. Minimum qualification is first or second class Honours Degree in Chemistry. Previous experience with ceramics, single crystals, solid state chemistry or high temperature processes would be an advantage. For the S.S.O. grade some years appropriate post-graduate research experience is essential. The salary ranges are: Senior Scientific Officer £1,040-£1,205 per annum (male) and Scientific Officer £505-£905 per annum (male). The starting salary for a Scientific Officer is assessed according to age, qualifications and experience. The successful applicant will be required to join the Authority's Principal Superannuation Scheme and contribute 6 per cent of salary. Housing will be available within a reasonable period for married officers who live outside the Establishment's transport facilities. During this period, lodging allowance may be payable to suitably qualified candidates. Application form from Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks. Quote Ref.: A231/WGE 38.

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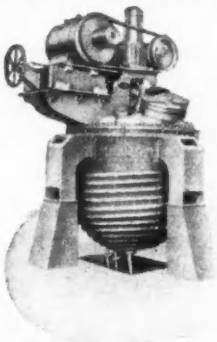
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INDEX to advertisers in this issue

	Page
Aerox Ltd.	510
Alcock (Peroxide) Ltd.	510
Ames Crosta Mills & Co., Ltd.	Cover iii
Baines, Leonard, & Co., Ltd.	Cover ii
British Thomson-Houston Co., Ltd. (The)	511
Chemitrade Ltd.	Cover iii
Classified Advertisements	552, 553, 554, 555
Clayton Son & Co., Ltd.	515
Collins Improved Firebars Ltd.	Cover iii
Dryden, T., Ltd.	551
Farwig, J. F., & Co., Ltd.	512
Feltham, Walter H., & Son Ltd.	555
Foxboro-Yoxall Ltd.	509
Gallenkamp, A., & Co., Ltd.	520
Girling, S., & Sons (Coopers) Ltd.	Cover ii
Glebe Mines Ltd.	517
Kingston upon Hull Development Committee (The)	556
Leeds & Bradford Boiler Co.	555
Lennox Foundry Co., Ltd.	516
Lord, John L.	Cover iv
Markland Scowcroft Ltd.	514
Metal Containers Ltd.	Front Cover
Metropolitan-Vickers Electrical Co., Ltd.	Cover iv
Mond Nickel Co., Ltd. (The)	518
Moritz Chemical Engineering Co. Ltd.	551
National Enamels Ltd.	556
Nordac Ltd.	513
Sandiacre Screw Co., Ltd. (The)	516
Thermal Syndicate Ltd. (The)	514
Unifloc Ltd.	512
Walley, A. L.	517
Wells, A.C., & Co., Ltd.	Cover ii

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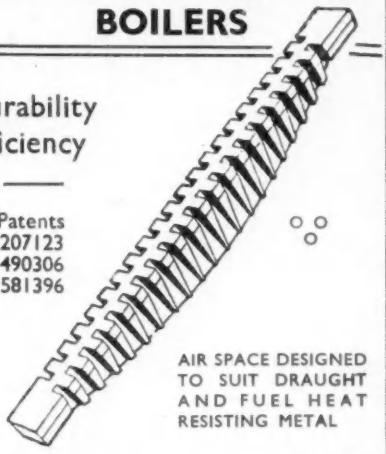
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